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Profits From Depression Purchases

J. M. SPENCER

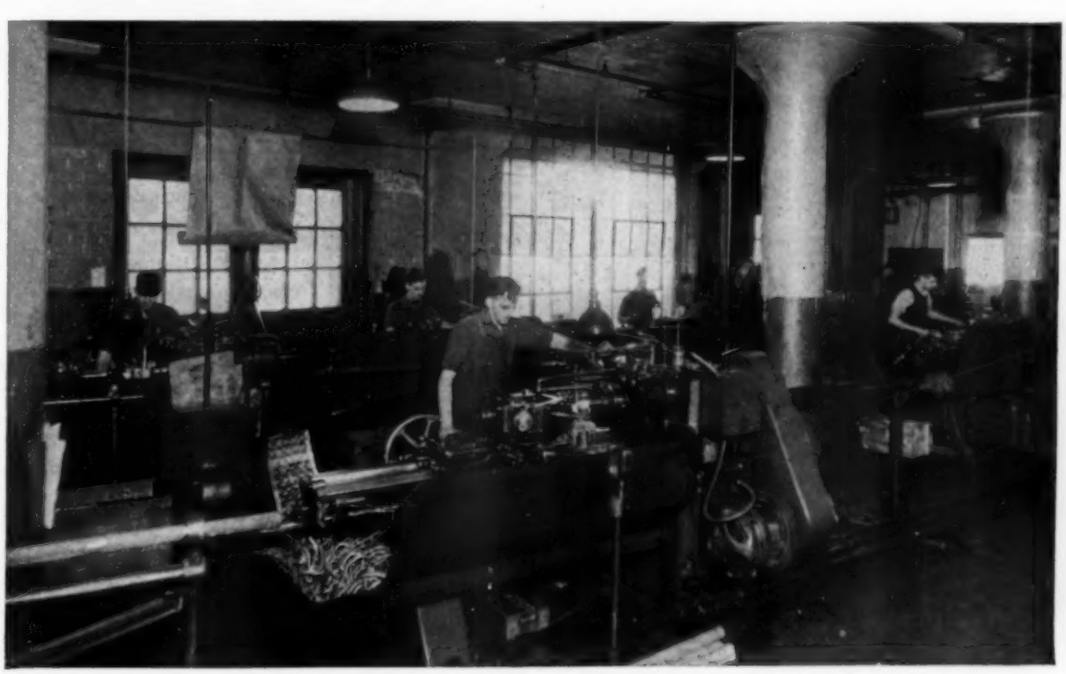
Vice-President and General Manager,
Hobart Manufacturing Company

By taking advantage of late developments in machine tool design, the Hobart Manufacturing Company has met the demand for closer tolerance while maintaining wages despite a cut in working hours

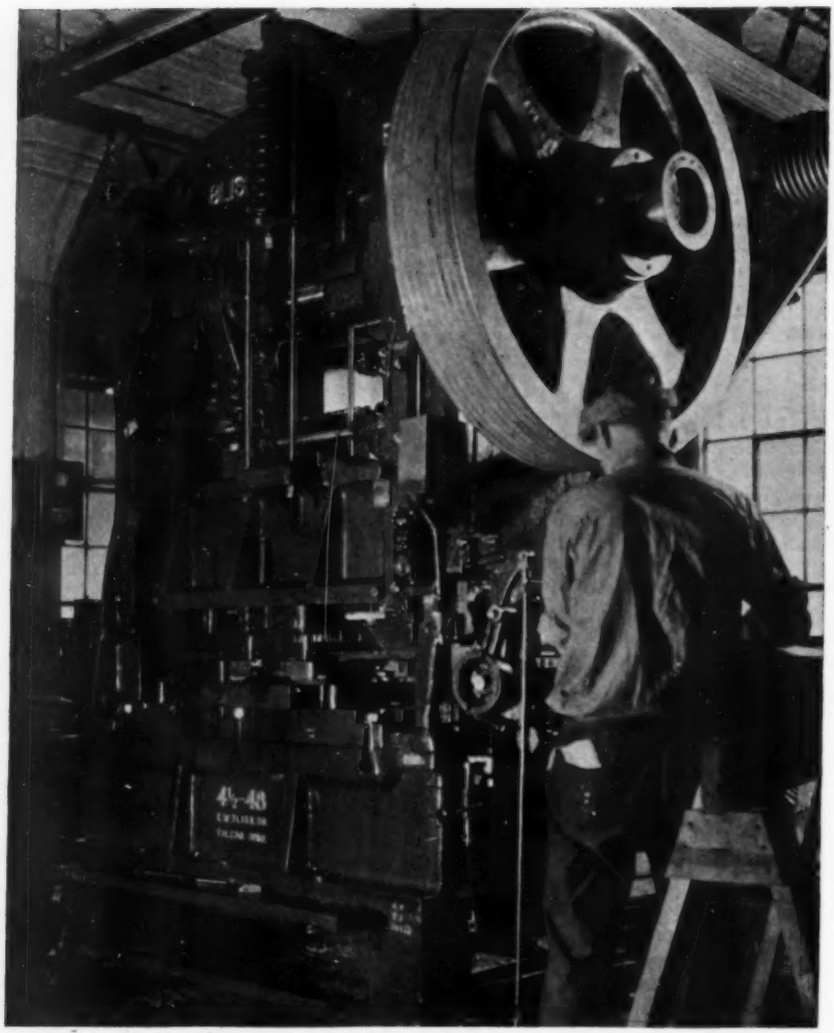
BACK in the fall of 1933 when machine tool builders generally were feeling that the bottom had dropped out of everything, more than a dozen of them got a bright ray of hope in the shape of sizable orders from the Hobart Manufacturing Company at Troy, Ohio. These orders, which totaled some $50,000, marked the beginning of an extensive program which the company had adopted to take advantage of recent developments in the machine tool industry and to replace perfectly good machine tools with better ones.

Since then the company's replacement program has gone on without interruption, until today more than $150,000 has been spent to install the most modern machine tool equipment that is available. In its modernization program, the company has purchased turret lathes, milling machines, horizontal and vertical boring mills, screw machines, shapers, automatic gear cutters, grinders, multiple drills, and punch presses.

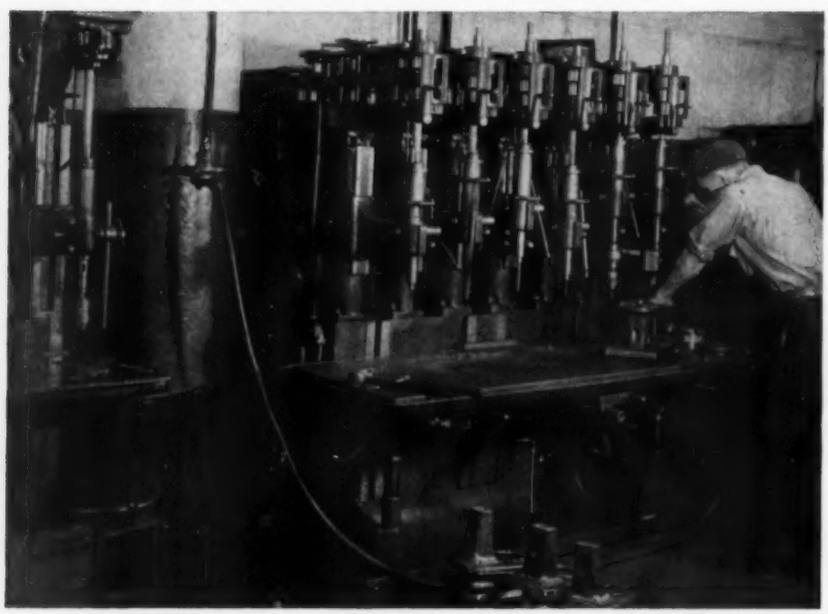
This does not include a similar program for speeding up and bringing to the same high manufacturing standards the Dayton plant (where the company makes store scales of all types). Nor does it include thou-



This battery of turret lathes is typical of the units added in Hobart's modernization plan



A 100 per cent increase in production over an old gap-type press was made by this new double-crank machine



Two motors drive this six-spindle gang drill so each group of three spindles may be used at a different speed

sands of dollars worth of new typewriters, electric adding machines, dictaphones, calculators and other office appliances which brought the company's offices up to the state of efficiency that is found throughout the factory.

There were several reasons why the company adopted its extensive replacement policy at a time when most other concerns were decreasing their purchases. One reason, lay in the fact that for years its business has been stable with comparatively little fluctuation from its steady upward trend. An optimism, even in the midst of a depression, was strengthened by a hopeful outlook for future business. So far as the management could see there was every possibility of continued increases. This outlook has not changed, but rather is constantly becoming more promising.

An Aid to Industry

It was also felt that so far as possible all concerns should follow President Roosevelt's suggestion and make purchases in the durable goods field. It seemed that there could be little hope of a substantial and permanent recovery until the durable goods industries were again on their feet, and their skilled employees again approached their normal purchasing power and standard of living.

Hobart's product is one requiring a high degree of precision in its manufacture. Its machines are bought by butchers, grocers, bakers, hotels, steamships, schools, hospitals, restaurants, in fact, in most places where food is sold or dispensed in every part of the world. This means that they must be foolproof, and one of the best ways to make machines foolproof is to manufacture them properly in the first place. This cannot be done if the machine tools in the plant are not of the very best.

Most of the machine tools were purchased as replacement tools rather than as part of an expansion program. The machine tool industry is continually improving its products to meet the demand of closer tolerances and greater speed of operation, as well as increasing rigidity to withstand vibration introduced by the more modern cutting tools.

Among the many tools installed is a Kearney & Trecker vertical milling machine, which is capable of using a tungsten carbide cutter at a feed of 60 in. per min. with a cutter speed of 1,200 r.p.m. This enables the oper-

ator to increase his daily earnings with greater ease and at the same time show a 20 per cent reduction in direct labor.

In the punch press department was installed a new No. 4½ 48 in. Bliss Press of 110 tons capacity with automatic feed. This press, equipped with progressive dies, will give a 100 per cent increase in production over the hand fed, open-gap type press. In addition, we are able to get five to six times the number of motor laminations off the dies on this press, over the same dies on the gap type press.

In the chucking department a 38-in. Warner & Swasey machine for boring motor housings and transmission cases has been installed, which will give a 50 per cent increase in production. This is due to having the part chucked and revolving, with stationary bars and cutters, instead of holding the part stationary and revolving the tools.

In purchasing and installing these new machine tools it was found that machine tool builders have made almost unbelievable improvements in their design, during the past few years. This is true whether it be in punch presses, lathes, mills, grinders, or drilling machines.

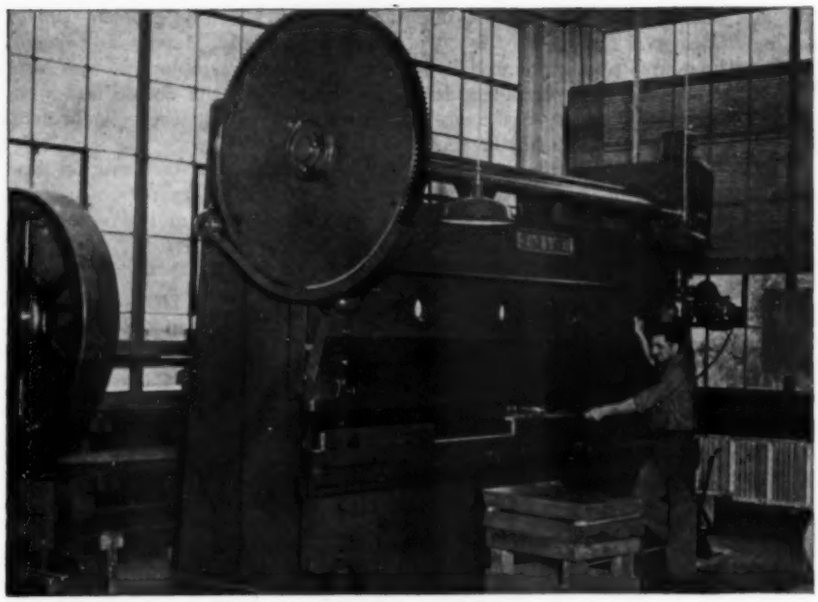
Time studies on the various jobs run on these new machines disclosed that they will show an average of not less than 15 per cent return on the investment.

Equipment Acquired

Recently the following machine tools have been purchased:

5 Warner & Swasey bar machines
1 Warner & Swasey chucking lathe
2 Gould & Eberhardt gear hobbing machines
1 Natco multiple drilling machine
1 Kearney & Trecker vertical mill
1 Lodge & Shipley engine lathe
1 Bliss punch press
1 Heald rotary surface grinder
1 Thompson surface grinder
1 No. 13 Brown & Sharpe cutter grinder
6 Jones & Lamson turret lathes
1 Cincinnati power brake
1 Avey 6-spindle drilling and tapping machine
2 Hisey-Wolf polishers

The management of the Hobart Company sincerely believes that the product of any industry is as good as the machine tools on which the work is performed. High quality work cannot be produced from a worn out and obsolete machine tool no matter how skilled and well-trained the operator may be. With these thoughts in mind, we propose to replace equipment whenever the need warrants it.



A large modern motor driven brake has played a part in improving production

Partly as a result of its extensive machine tool purchases, the company has been able to make a rather remarkable record. A comparison of the earnings of twelve typical employees for one month in 1928 and one month at the end of 1934 showed that the total earnings of the twelve men were just $12.26 less in 1934 than in 1928; this in spite of the fact that their hours had been reduced by 19 per cent.

While this was due in part to a 10-cent an hour increase in pay, it was caused to a larger extent by the new machine tools with their cemented tungsten carbide cutters. These machine tools have enabled the men to increase their production sufficiently to offset their increase in leisure time.

The company also has the distinction of never having closed its plant for a single working day in almost 40 years of its existence.

But even the finest machine tools, as pointed out by W. H. Hartley, factory manager, must have well trained and highly skilled operators. Troy, Ohio, is a city of 10,000 population. Obviously there is no labor pool on which the company can draw to meet its needs. To hire men in other cities and bring them to Troy is unsatisfactory. There is also the constant need for executives of all types who have been trained in the methods and tradition of the organization.

To meet this situation the company has inaugurated its own training program in conjunction with the Smith-Hughes program in the State of Ohio. Applicants for the course must be at least 18 years old and have a high school education or its equivalent. The course is designed to take two years and consists of 4,000 shop hours and 450 hours devoted to class room work. Broadly, the subjects treated in the class room are mathematics, science, shop information and blue-print reading.

These broad subjects are divided into such things as the study of ferrous and non-ferrous metals; tempering and heat-treating and its effects; tests and testing hardness; lubrication; cutting fluids; power transmission; shop safety; grinding wheels, polishing and buffing; plating; paint; shop information; organization and personnel; management, including explanation of fixed investment, operating expense and waste elimination; foundry practice; motors; machine shop practice; use of scales, squares and rules, mathematical computation from working drawings; measurement of threads; use and construction of charts and tables; layouts involving areas; plain geometry; simple and compound gearing; calculation of cutting and grinding speeds; graduated dials; calculating tapers; mathematics of gearing; shrink fits; precision instruments for measuring; slide rules; free hand sketching; orthographic projec-

tion and the care to be exercised in making drawings.

When the course was announced by Mr. Hartley there was considerable curiosity as to its reception by the employees. A limit of 18 students was set for the first year. Within 24 hours after the announcement was made, 25 men had asked to be enrolled with every possibility of additional applications coming in. The problem which now confronts Mr. Hartley is to take care of all the employees who are qualified to take the course and who have indicated that they would like to do so.

With this course in operation the company is able to train its own foremen and executives and give its employees a real incentive.

Power Factor Control

JAMES C. HARPER
Superintendent, Landis Machine Company

INDIVIDUAL motor drive was considered the best solution to several undesirable conditions existing in one of the departments at the Landis Machine Company. This department is devoted exclusively to machine operations necessary in the manufacture of the Landis chaser used in its threading machinery. The machines used are small plain milling machines which were formerly belt driven through countershafts from two main lineshafts. Power was furnished by two d.c. motors of 25 and 15 hp., respectively.

There are a great many of these machines; the belts and overhead construction for hanging counters offered considerable obstruction to daylight entering through the skylights and side windows. This was one of the most important factors in the decision to change to individual motor drive. By eliminating all overhead construction and belts, artificial lighting could be applied to better advantage.

Lineshaft Elimination

It is often necessary to operate some of these machines overtime to meet delivery requirements of this product; the number of machines involved depends on the demand. Considerable power savings could be effected by eliminating the necessity of operating one entire lineshaft for a few machines. This was probably the second most important point in favor of individual motor drive. The elimination of oiling and belt maintenance were other points in favor of individual drive.

During the summer months, when heat is not required, all power is purchased from a central power company at 2,200 volts, 3-phase, 60 cycle, and stepped down to 220 volts through a delta-connected transformer bank. Direct current for crane service and departments that have not been changed to alternating-current is furnished by a motor-generator set. It was decided to use 220-volt, 2-phase, 60-cycle, 1750-r.p.m. motors on these machines, and as the power contract contains a demand charge and power factor clause we started a general program of power-factor correction for the entire plant. The average power factor at that time was around 50 per cent.

The first step in the program was to check the loading of the motors on a number of individual drive machines. It was found that because of the nature of the work it was possible to use smaller motors on some of the large milling machines and boring mills. In a number of cases a 3-hp. motor could be used in place of the 10-hp. unit then on the machine. Capacitors were installed on several large motors driving groups of machines. The 150-hp. synchronous motor on the motor-generator set has an 80 per cent leading power factor. The improved load conditions of the motors and the corrective equipment used raised the power factor to 79 per cent, an increase of 29 per cent. When the program is completed we aim to have an average power factor of 85 to 90 per cent.

Advantages of Under-Motoring

In line with this program, it was desirable to keep the average power factor of this department as high as possible. With this in mind we decided to investigate the possibility of under-motoring these machines. Tests on a number of machines showed that for the same width of stock the coarser pitch chasers required more power than the finer pitch. As these machines are equipped with jigs for a certain width of stock, different pitch chasers will pass across these machines in the normal flow of production. It was decided to use standard motors of such size that, when machining the size chaser requiring the most power, not more than a 25 per cent overload would exist. The complete installation consists of 54—¼ hp., 50—½ hp., 24—¾ hp., and 1—1 hp. motors; the total installed horsepower is 57.

A recent test made to check results shows that in general on the roughing operation the load condition is fairly good, but on the finishing operation, and on some very fine pitch chasers, the motors are underloaded. The total power required for the entire department is 11.2 kw. The average power factor is 68 per cent; at time of test the department was operating at about 55 per cent capacity. With the old group drive the power required for full capacity was 23 kw.

Good Average Performance

Considering the variable power requirements and the low power factor rating of fractional-horsepower induction motors, we believe that an average power factor of 68 per cent is very good for this large group of motors and would not have been obtained if less care had been taken in the selection of motors for these machines. Keeping the power factor as high as possible before corrective equipment is applied reduces the size of corrective equipment necessary to raise power factor to the desired value.

The results of several tests made on individual machines are given here:

¼-hp. motor on a machine roughing ⅞x2⅛ 11 P. chasers—0.24 kw., 68 per cent power factor. The efficiency of a ¼-hp. motor is 71 per cent at full load. Then $0.24 \times 1.34 \times 0.71 = 0.228$ hp. which is 91 per cent of the rating of the motor.

¼-hp. motor on a machine roughing ⅞x2⅛ 10 P. chasers—0.28 kw., 80 per cent power factor. Then $0.28 \times 1.34 \times 0.71 = 0.266$ hp. which is 103 per cent of full load rating.

When the same machine finished the same size chaser—0.12 kw., 50 per cent power factor. Then $0.12 \times 1.34 \times 0.63 = 0.101$ hp., which is 40 per cent of full load.

Sewing Machine Parts

FRED B. JACOBS

Selected examples show the close tolerances met at the White Sewing Machine plant and the methods used to achieve them

PRECISION grinding, as we know it today, had its inception in the sewing machine industry over 75 years ago; at that time there arose a demand for the more accurate and economical finishing of shafts, needle bars and like parts than could be afforded by the slower method of turning followed by hand filing.

Thus were born the first crude "grinding lathes," and from these were developed the cylindrical grinding machines of today. The sewing machine industry and the development of cylindrical precision grinding went hand in hand.

When the White Sewing Machine Company was established in Cleveland, nearly 60 years ago, cylindrical grinding machines held a prominent part in the shop equipment. The methods followed today at the White plant are the result of many years of development work along specific lines.

Grinding in One Department

An entire sewing machine head weighs only a few pounds so the various components are comparatively small. Out-and-out straight-line production as seen in automobile plants is not necessary, the departmental method being used instead. Practically all precision grinding operations are performed in one department equipped with up-to-date tools.

The operation illustrated in Fig. 1 consists of finishing two bearings on an uper shaft. This part is machine steel formed to shape by bulldozing. The single crankpin, which can be seen just back of the work rest, is not finished by grinding. The two ground portions are 3 in. long and 0.483 in. in diameter, finished with a tolerance of 0.0002 in. plus or minus. This same tolerance applies to practically all other parts finished by grinding.

Referring again to Fig. 1, the work is held between centers, dogged in the usual way, and supported by a single work rest. The machine is a Norton 10 x 36 in. grinder with an oscillating head; the wide-wheel method is used. The wheel is Alundum, 14 in. in diameter, 3 in. face, 24 combination grit, *K* grade, operated at a normal peripheral travel of 5000 surface ft. per min. The grinding allowance is 0.0006-in. While the entire shaft is 13¾ in. in length, the ground portions at the ends are only 3 in. long so this small amount of stock suffices. The work speed is 120 r.p.m.

Cam rolls for sewing machines must be finished with a high degree of accuracy, for if they are loose on their studs or in their cam grooves, the finished machine, operating at high speed, will develop objectionable noise. In Fig. 2 is shown a typical cam-roll finishing operation. The machine used is a No. 2 Brown & Sharpe grinder fitted with an Alundum wheel, 14 in. in diameter, ½ in. face, 80 grit, *N* grade, operated at a surface speed of 5,500 ft. per min. The speed of the work is 350 r.p.m.

The rolls in the process of grinding are slightly tapered on the face, 0.354 to 0.358 in. in diameter and ¼ in. wide; the hole is 0.200 in. in diameter. These parts are machine steel, case hardened; previous to this grinding operation the holes are finished by grinding on a Bryant internal grinder.

Location for Taper

In the operation under discussion two grinding arbors of exactly the same length are provided. The ends that accommodate the rolls are tapered very slightly so that the work can be wrung in place with the end just flush with the end of the arbor. This permits the operator to rely on the cross-feed screw

Fig. 1—Bearings on the upper shaft are held within 0.0002 in. tolerance by grinding with the infeed method

graduations for bringing his work nearly to size, which practice would not be possible if the work was not located accurately in relation to the arbor because of its slight taper.

Not all cam rolls, however, have tapered faces nor must they be finished with a high degree of accuracy. In Fig. 3 is shown the operation of finishing straight-face rolls, $\frac{7}{8}$ in. in diameter, $\frac{1}{4}$ in. face. This machine is a No. 2 Brown & Sharpe grinder, fitted with an Alundum wheel 12 in. in diameter, $\frac{1}{2}$ in. face, 80 grit, *N* grade operated at a surface speed of 5,500 ft. per min. while the speed of the work is 160 r.p.m. This grinder is fitted with a special head designed by the White company engineers. It has a hand-operated chucking lever which actuates a pin to expand the end of a special arbor to grip the work. The arbor is held in place with a taper fit. This device works somewhat on the principle of the collet mechanisms used on hand screw machines.

In Fig. 5 is shown a sewing machine shuttle. This unit is $1\frac{5}{8}$ in. in diameter, with an annular ring around three-quarters of its circumference. This ring is $\frac{1}{8}$ in. thick, and its sides and outer diameter must be finished accurately so that it will fit the shuttle carrier properly. The shuttle is of the rotary type and is driven by two pins which fit into holes diametrically opposed and spaced $1\frac{3}{8}$ in. apart. These holes are used in locating the work for grinding.

The grinding operation on the sides of the annular ring is shown in Fig. 4. The machine is a No. 1 Brown & Sharpe grinder fitted with a special headstock designed by the White company engineers. The grinding wheel is Alundum, 12 in. in diameter, $\frac{1}{2}$ in. face, 80 grit *N* grade, operated at an approximate peripheral speed of 5,000 ft. per min. The work is held in place over two locating pins fitting in the holes previously mentioned in a special driver located on the work head spindle. Pressure is applied to hold

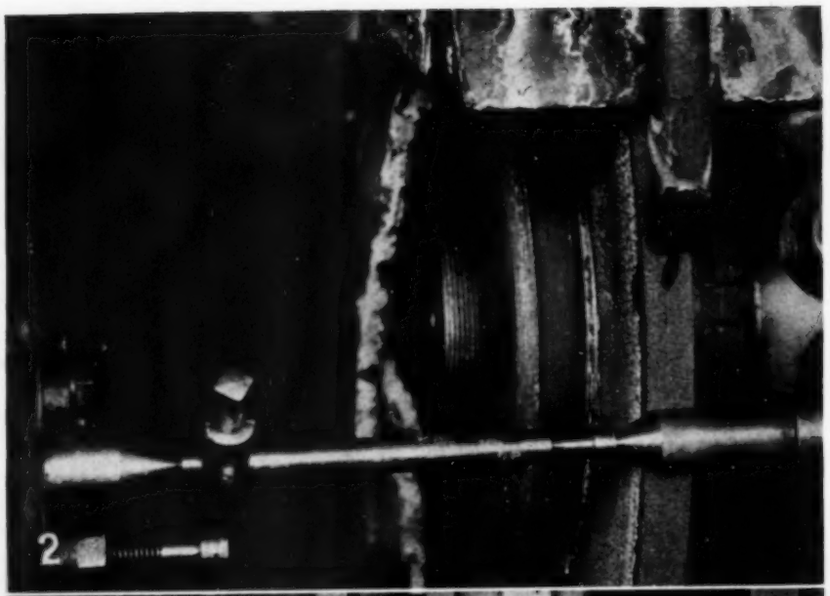


Fig. 2—Hardened cam rolls are furnished with a slight taper by carefully locating them on the work arbor

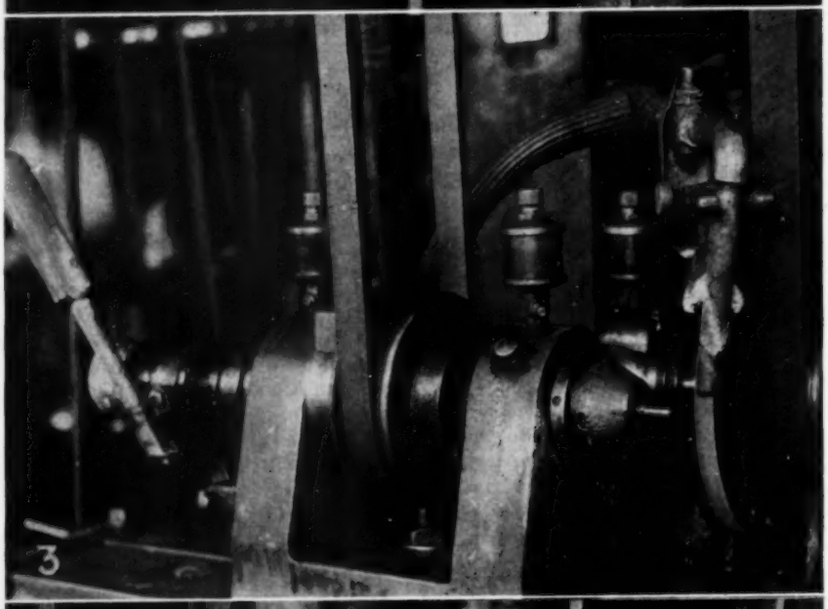


Fig. 3—Straight-feed cam rolls for slower operation are ground on an expanding arbor

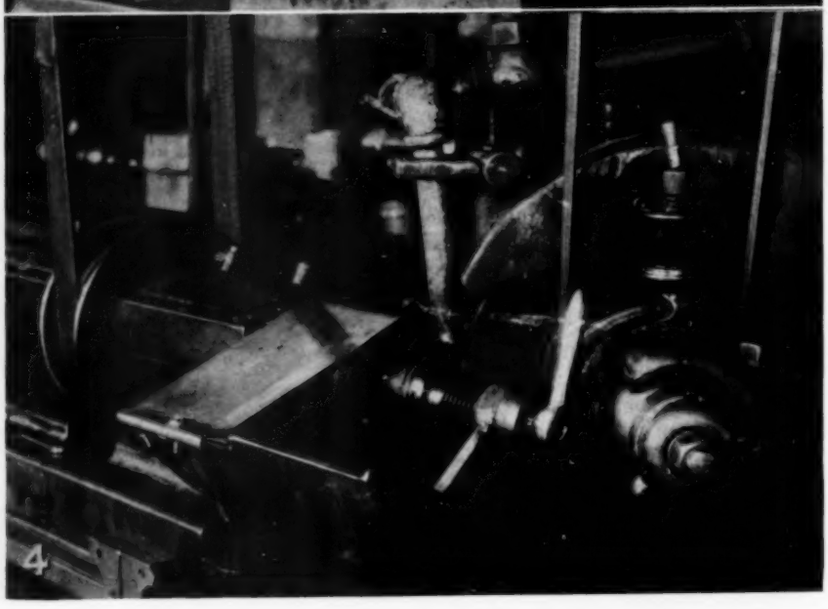


Fig. 4—With the wheel head set over 45 deg., the side of the annular flange on the shuttle is ground

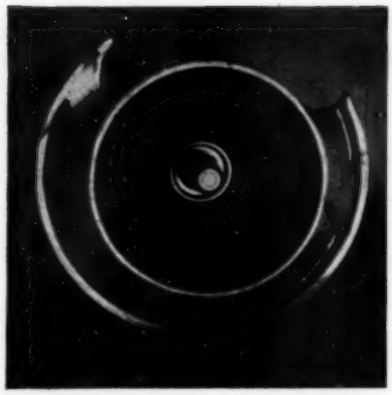


Fig. 5—Special care must be employed in finishing the shuttle shown above

lation between the outer diameter and the holes for the locating pins must be maintained. The finished shuttles are tested in the special fixture shown in Fig. 6. The two knurled-head locating pins enter the holes in the shuttle. Then by turning the spindle on which the shuttle is located, any inaccuracy is readily noted when the plunger of the little dial indicator is brought against the outer diameter.

While the foregoing are only a few of the precision grinding operations followed at the White company's plant, they reveal the high degree of accuracy necessary in finishing these comparatively small units.

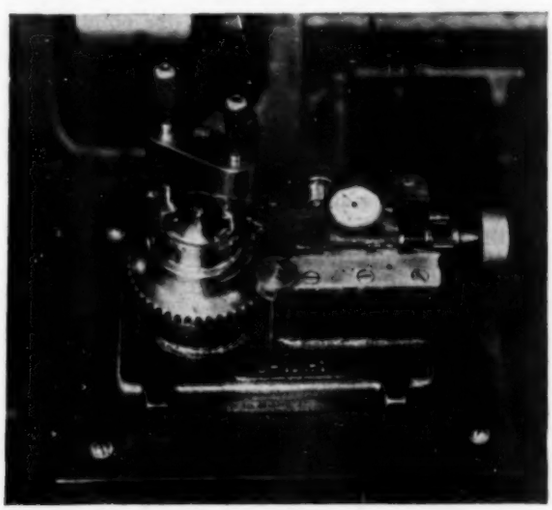


Fig. 6—The checking of finished shuttles by rotating them in a fixture in contact with a dial indicator forms a good example of the White Sewing Machine Company's careful inspection methods

the work in place by a cam-actuated plunger provided with spring tension as Fig. 4 shows. The plunger is operated by the handle shown in an upright position.

As Fig. 4 shows, the wheel head is set over at an angle of approximately 45 deg., so that the wheel face performs the grinding. This results in a much more satisfactory operation than can be obtained by using the side of the wheel, recessed slightly, which is common practice for face granding operations of this kind. After one side is ground on a number of shuttles, they are reversed in the holder and the other side is finished.

The outer diameter of the shuttle is finished in another machine fitted with the same kind of a holding device as shown in Fig. 4. In this case the wheel is, of course, set parallel with the work.

To insure smooth operation in the finished machine, the outer diameter of the shuttle must be an accurate circular segment and the correct re-

Bureau of Standards Makes Tests of Bolts

To provide more accurate data on the impact and tensile properties of bolts, 360 specimens were recently tested at the National Bureau of Standards. These represented all possible combinations of five different materials, four different bolt diameters, and three different thread forms.

The work required to rupture the bolts under suddenly applied loads was greater for those having fine threads than for those with coarse threads in practically all cases. The only exceptions were certain brass bolts and cold-rolled steel bolts, which showed brittle failures. For bolts of the same size and having the same threads the bolt efficiencies were approximately the same for all of the materials.

According to Lyman J. Briggs, director of the Bureau, engineers can now pick screw threads that will give the best results under given conditions.

Welded Jigs and Fixtures Discussion

A. EYLES
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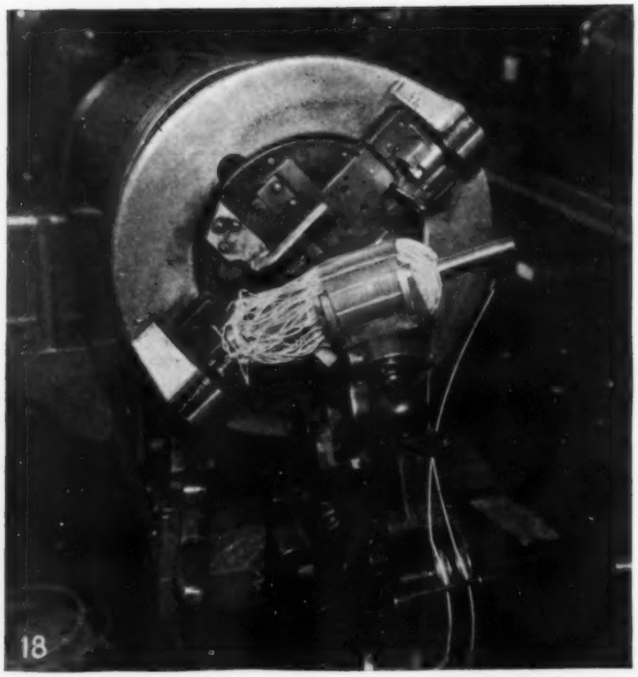
In reading the article by John R. Godfrey under the title given above (*AM*—Vol. 78, page 749), I was reminded of several welded jigs and fixtures that were designed some fifteen or twenty yeargs ago for forming elliptical roof sections, double curvature paneling, elliptical bodies for water tanks, bending flat steel edgewise, etc., for passenger cars.

Having supervision of the oxyacetylene welding equipment in a large sheet-metal fabricating shop, it was my earnest desire to utilize the equipment whenever practicable, and also when welded jobs seemed to prove more economical and efficient. Experience in welding technique has proved that welded jigs and fixtures are far lighter to handle than are the more cumbersome riveted fixtures. They are also neater, less costly to make and equally strong. Hence, today, welded jigs and fixtures are used extensively in up-to-date welding shops because economy, increased space, speed, standardization of products and their components, and regularity of the welding operations are secured by their judicious use.

Referring to Mr. Godfrey's remarks about the struggle a fixture engineer had to introduce welded fixtures in his own shop, it may be said with truth that when gas and arc welding first began to attract attention in industry, much prejudice came from the plant superintendents and works managers, which retarded fusion welding practice for some length of time. Today, however, the application of fusion welding methods are unlimited, and it may be safely said that there is hardly an industry that does not have some use for modern welding equipment.

Alloy Steel Freight Cars

The new trains, streamlined and otherwise, are having their affect on railway thinking. Instead of "bigger and heavier" which has been the slogan, reduction of dead weight seems to be digging in for a toe hold. The Pressed Steel Car Co. announces a hopper car which saves 13,000 of the 43,000 lbs. formerly thought necessary. Alloy steels, plus new designing, are responsible for the weight reduction. Then, too, the carrying capacity is increased from 56½ to 69½ tons. Moves like this will do much to put railways on a sounder basis.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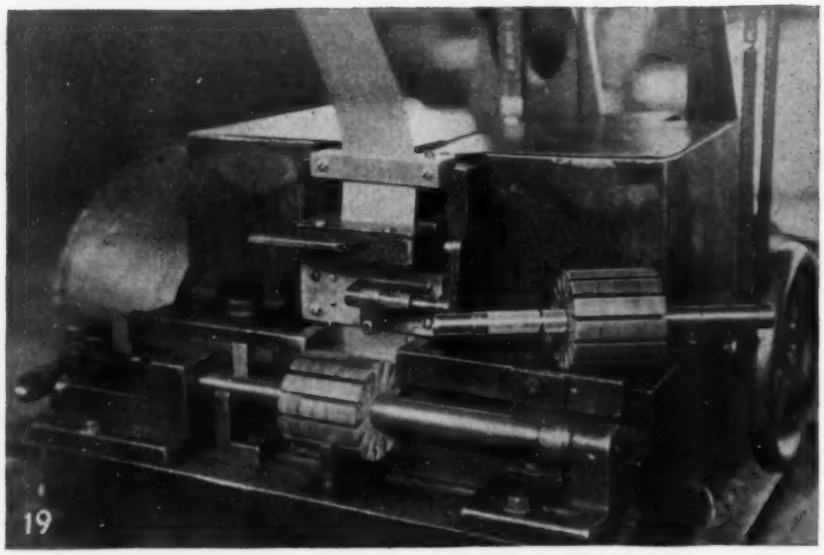
STARTERS AND GENERATORS IN PROCESS III

TWO PREVIOUS installments brought the manufacturing operations on the Auto-Lite starter and generator to the point of installing the electrical windings. Special machines and unusual set-ups are described in this third, and last, part of the article.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● Windings are of several varieties but all must be designed to maintain balance in the armature. The speeds at which the generator armatures run would transmit any appreciable unbalance to the motor and to the car itself. In all the armatures the slot is insulated by special heavy paper, in an ingenious machine which feeds the paper, forces it into the slot, cuts it off and indexes to the next slot, stopping when the last slot has been filled. This machine is seen in Fig. 19. Some of the coils are wound directly in the slot itself as in Fig. 18. corresponding pairs of slots, one each side of the shaft, being parallel to each other. In other armatures the coils are wound separately, taped up individually, and then put in the proper slots. Some of these are so wound that parts of two coils are in each slot. The coil winding machines used have been developed in this plant and have been greatly improved during the past year. Connecting each coil with its proper commutator bar and soldering the connection, completes this work.

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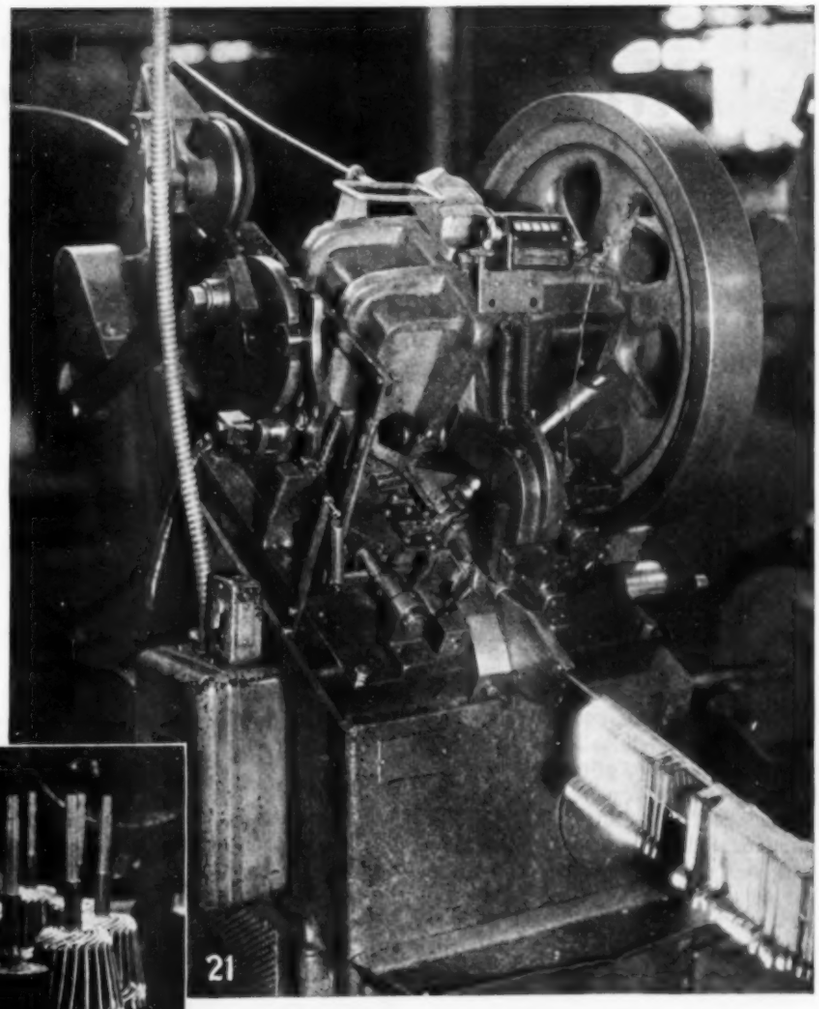
● Coils for the field poles are comparatively simple, being wound by automatic machines, taped, and formed to the curvature of the inside of the frame. They are simply slipped over the small end of the field poles which are then screwed into place inside the frame. The completed armatures are treated with insulating compound and baked.

● After assembly they are again placed in conveyors, as in Fig. 20 and connected to a source of current which runs them in, which assures all the bearings being O.K. They get about an hour's run-in in this way, and when they are sufficiently cool, they are set for the proper current generation, and tested.

● Coils for the starting motor armature are made from a single coil of tin-coated copper wire, of a flattened section. Being of such low voltage and performing the work it does in starting a cold motor, it must pass a large amperage of current and so requires a large conductor. These coils are formed automatically in special machines, designed by the plant executives themselves. One of these is seen in Fig. 21.

● As these coils leave the machine they feed themselves onto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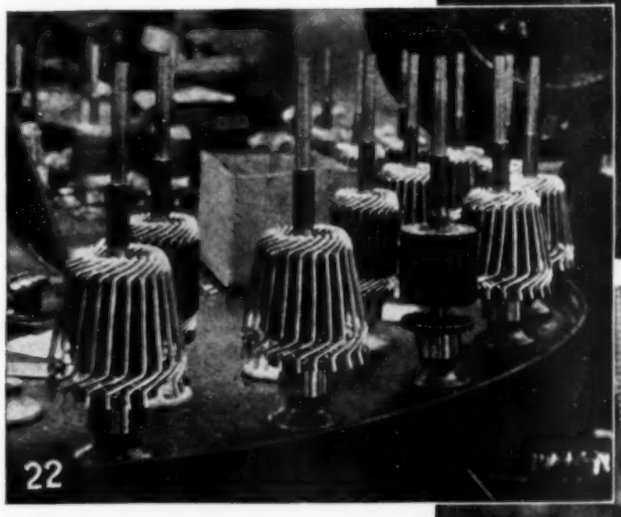
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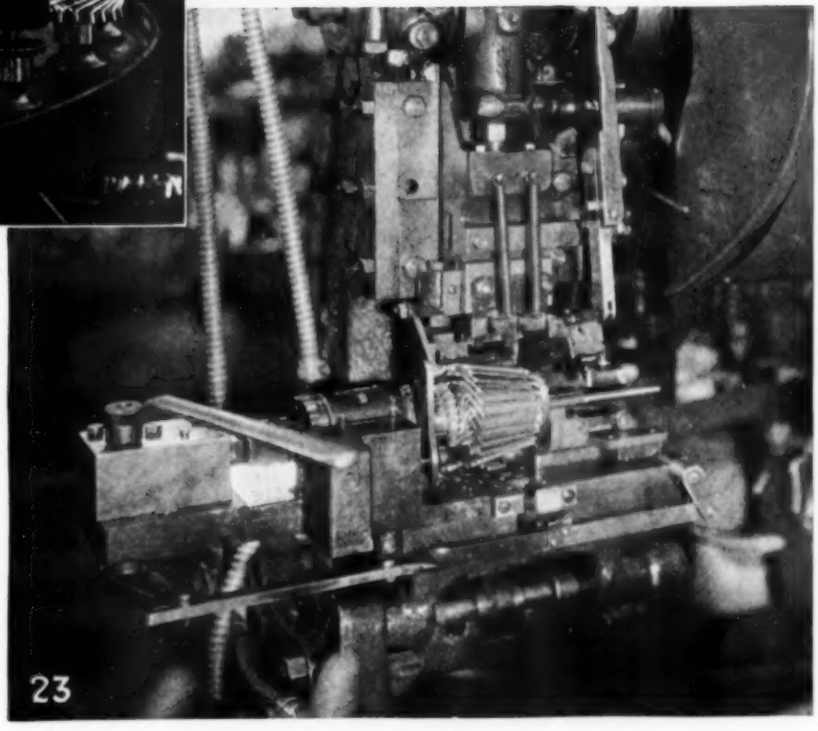
suitable racks that are hung on overhead conveyors and carried to the assembly tables, as in Fig. 22. Here they are hung, or placed in the proper slots at the block end of the armature, placed in holes as shown, and carried by the revolving table to the special machine, Fig. 23, which forces the commutator end into the proper slot. With the armature in the machine, located in a special horizontal position, it is indexed automatically after each stroke of the press until all the coil ends have been forced into their proper positions. These connections are then soldered.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Block Gaging Involute Gears

A. C. RASMUSSEN
Chief Engineer, Insley Manufacturing Company

Thickness of tooth in either standard or long and short addendum gears may be determined progressively without removing the work from the machine

PROFESSOR EARLE BUCKINGHAM, in his book, "Spur Gears," refers to an article by Ernest Wildhaber on "Measuring Tooth Thickness of Involute Gears" (*AM*—Vol. 59, page 551). Since then several writers have contributed articles on the subject in recent numbers of *American Machinist*. However, no one has set forth formulas for measuring a gear having a long or short addendum. The method of Mr. Wildhaber's offers such a convenient means of measuring tooth thickness that we expanded the method to measure gears with other than a standard addendum, of which we have been using a great many. Likewise, the depth of cut to obtain a desired backlash has been determined. These formulas are developed for teeth cut with standard proportioned hobs and cutters.

This method of measuring works out so advantageously that the operator can feed in the cutter to nearly the correct depth and can then block measure over the required number of teeth for a preliminary check. From the measurement obtained, compared with the correct block measurement given on the drawing, the additional cut to take may readily be determined. The depth of cut is also stated on the drawing, and this gives the machine operator a check on his calculations. All of this measuring is done while the gear is still on the machine, and the advantage is quite evident.

The hypothesis on which Wildhaber's method is based may be stated as follows:

The block measurement over a given number of teeth T is equal to the thickness of the tooth on the base circle plus S normal pitch intervals.

Referring to the sketch, Fig. 1, the block measurement over four teeth of a 30-tooth gear is shown. It is apparent that a measurement could be taken over three teeth or even two. However, if too few a number of teeth are included, the measurement is taken too near the root, and interference may result. Also, with long addendum teeth or with a larger number of teeth in the gear, the base circle may come within the root circle. If too great a number of teeth are included, the measurement may be inaccurate or incorrect in that point A or B, or both, may come too near the tooth tip or even fall outside the outer radius. The truest portion of the involute curve is near the pitch circle. Therefore, the measurement is taken over that number of teeth that comes nearest to intercepting an angle equal to twice the pressure angle. The number of teeth over which the measurement is taken depends on the number of teeth in the gear. It should be observed that the line of the measurement AB is always tangent to the base circle.

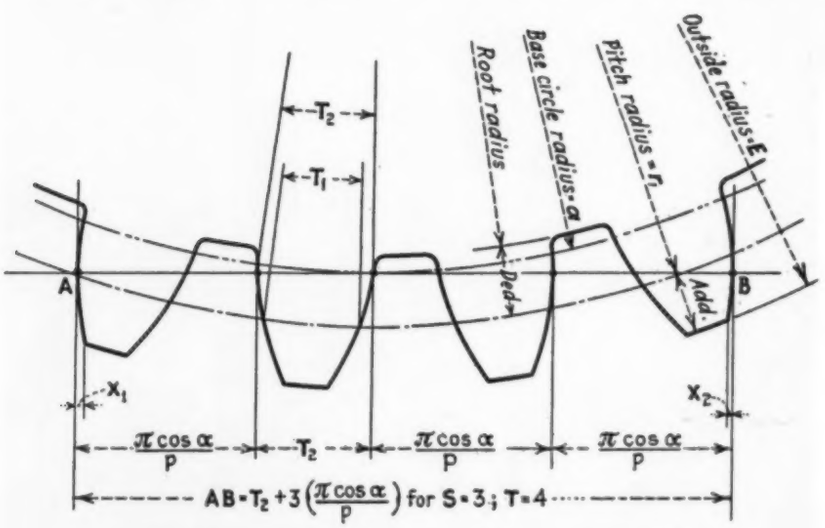


Fig. 1—Block measurement for a 30-tooth gear, 20-deg. pressure angle, standard addendum, $u = 1.00$

Nomenclature:

- AB = block measurement, in.
- T_1 = tooth thickness on pitch circle.
- T_2 = tooth thickness on base circle.
- S = number of tooth spaces between teeth over which measurement is taken.
- T = number of teeth over which measurement is taken = $(S + 1)$.
- p = diametral pitch.
- $\frac{\pi}{p}$ = corresponding circular pitch.
- α = pressure angle.
- d = pitch diameter.
- r_1 = pitch radius.
- N = number of teeth in gear.
- E = outside radius.
- a = base circle radius.
- $\text{inv}\,\alpha$ = involute $\alpha = (\tan\alpha - \alpha)$.
- $\frac{\pi \cos\alpha}{p}$ = circular pitch on base circle.
- u = ratio of addendum to standard addendum.
- B = backlash, in.
- g = extra depth of cut to obtain backlash B.
- H = backlash resulting from spreading gear centers.
- h = spread of gear centers due to overrun in center dimension tolerance.

In accordance with the definition for block measurement,

$$AB = T_2 + S\frac{\pi\cos\alpha}{p} \qquad (1)$$

An inspection of Equation 1 shows that AB is made up of T_2, which varies in accordance with T_1, the thickness of the tooth on the pitch circle and $S\frac{\pi\cos\alpha}{p}$ of which $\frac{\pi\cos\alpha}{p}$ is constant for a given pressure angle and pitch, and S, which depends upon the number of teeth in the gear. Therefore, AB is composed of a variable, depending upon the depth to which the cutter is run, or length of addendum, and a given number of S normal pitch intervals.

$$T_2 = 2a\left(\frac{T_1}{2r_1} + \text{inv}\,\alpha\right) \qquad (2)$$

in which $2a = \frac{N\cos\alpha}{p}$

and $2r_1 = \frac{N}{p} = d$

$$\therefore\quad T_2 = \frac{N\cos\alpha}{p}\left(\frac{T_1 p}{N} + \text{inv}\,\alpha\right)$$

$$= T_1\cos\alpha + \frac{N\cos\alpha\,\text{inv}\,\alpha}{p} \qquad (3)$$

With a tooth of standard proportions, in which the addendum equals the dedendum, the thickness of the tooth on the pitch line is equal to half the circular pitch. However, with long addendum teeth, the tooth thickness on the pitch circle is greater than one-half the circular pitch, and with short addendum teeth, it is less than one-half the circular pitch.

In terms of u, the thickness of a tooth on the pitch line can be written:

$$T_1 = \frac{\pi}{2p} - \frac{2\tan\alpha}{p} + \frac{2\tan\alpha}{p}u \qquad (4)$$

$$T_1 = \frac{1}{p}\left(\frac{\pi}{2} - 2\tan\alpha + 2\tan\alpha\,u\right) \qquad (5)$$

Substituting Equation 5 in Equation 3:

$$T_2 = \frac{1}{p}\left[\left(\frac{\pi}{2} - 2\tan\alpha + 2\tan\alpha\,u\right)\cos\alpha + N\cos\alpha\,\text{inv}\,\alpha\right]$$

$$= \frac{1}{p}\left[\left(\frac{\pi}{2} - 2\tan\alpha\right)\cos\alpha + 2\sin^2\alpha\,u + N\cos\alpha\,\text{inv}\,\alpha\right] \qquad (6)$$

Indicating the various constants in Equation 6 by coefficients, let

$$a' = \left(\frac{\pi}{2} - 2\tan\alpha\right)\cos\alpha$$

$$b' = 2\sin\alpha$$

$$c' = \cos\alpha\,\text{inv}\,\alpha$$

Then $T_2 = \frac{1}{p}(a' + b'u + c'N)$ (7)

If backlash is to be provided, the cutter is run in deeper, thereby reducing the tooth thickness on the pitch line and increasing the clearance. Indicating the backlash by B and this extra feed by g, then

$$g = \frac{B}{b'} = c'B \qquad (8)$$

The block measurement over the proper number of teeth T corrected for backlash B, then is written:

$$AB = T_2 + \frac{d'S}{p} - B \qquad (9)$$

$$AB = \frac{1}{p}(a' + b'u + c'N + d'S) - B \qquad (10)$$

in which, $d' = \pi\cos\alpha$

Equation 10 is the one to use in making the calculations.

In order to intercept an angle near to twice the pressure angle, the measurement AB should include that number of normal pitch intervals that comes nearest to equalizing $2r_1\sin\alpha$

$$\text{or}\quad 2r_1\sin\alpha = T_2 + S\frac{\pi\cos\alpha}{p} \qquad (11)$$

$$\text{Since}\quad T_2 = 2a\left(\frac{T_1}{2r_1} + \text{inv}\,\alpha\right)$$

$$= T_1\frac{a}{r_1} + 2a\,\text{inv}\,\alpha \qquad (12)$$

$$\text{and as}\quad T_1 = \frac{\pi}{2p},\ \frac{a}{r_1} = \cos\alpha$$

$$\text{and}\quad 2a = \frac{N}{p}\cos\alpha$$

$$\therefore\quad T_2 = \frac{1}{p}\left(\frac{\pi}{2} + N\,\text{inv}\,\alpha\right)\cos\alpha \qquad (13)$$

$$\text{also}\quad 2r_1 = \frac{N}{p}$$

Rewriting Equation 11:

$$\frac{N}{p}\sin\alpha = \frac{1}{p}\left(\frac{\pi}{2} + N\,\text{inv}\,\alpha\right)\cos\alpha' + S\frac{\pi\cos\alpha}{p} \qquad (14)$$

reducing $S = \frac{\alpha}{\pi}N - \frac{1}{2}$ (15)

As S must be a whole number, use the nearest whole number to the value of S found in Equation 15,

then $T = (S + 1)$ (16)

Assuming that the outside diameter of the gear blank is equal to d + twice addendum, then the depth that the cutter is fed is equal to

clearance + working depth + g

If the gear blank is larger or smaller, the depth of feed must be corrected accordingly.

Hobs and cutters are ordinarily made with the clearance equal to $\frac{0.05}{p}$; therefore,

$$\text{Depth of feed} = \frac{2.05}{p} + g \qquad (17)$$

Occasionally backlash is provided by spreading the centers of the gears. The effect of this is to increase the pressure angle above the normal pressure angle for which the hob or cutter is made.

Table I—Value of Constants

Constant	Pressure angle, degrees	
	14½	20
a'	1.020 002 7	0.792 025 5—
b'	0.500 760 0	0.684 040 2
c'	0.005 368 2	0.014 005 5—
d'	3.041 525 4	2.952 131 4
$\frac{1}{b'} = e'$	1.996 964 6	1.461 902 4

Table II—S and T, 14½ deg. pressure angle

N	S	T	N	S	T
min.-12	0	1	63–75	5	6
13–25	1	2	76–87	6	7
26–37	2	3	88–99	7	8
38–50	3	4	100–112	8	9
51–62	4	5	113–124	9	10

Table III—S and T, 20 deg. pressure angle

N	S	T	N	S	T
min.-9	0	1	55–63	6	7
10–18	1	2	64–72	7	8
19–27	2	3	73–81	8	9
28–36	3	4	82–90	9	10
37–45	4	5	91–99	10	11
46–54	5	6	100–108	11	12

Approximately the same backlash is obtained when spreading the gears h inches as is obtained by increasing the depth of cut by that same amount. However, additional backlash does result from the tolerance that is allowed in the boring of the shaft holes. This statement assumes that the tolerance permits an overrun in the center distance and no underrun. If h is the overrun in the center distance, then in accordance with Equation 8, in which h and H are substituted for g and G respectively,

$$H = hb' \qquad (18)$$

Example: Find the block measurements for a pinion and gear 8 D.P., 20 deg. pressure angle. Pinion: 17 tooth, long addendum, $u = 1.50$. Gear: 76 tooth, short addendum, $u = 0.50$. Shaft centers, $15.500 \begin{matrix} +0.005 \\ -0.000 \end{matrix}$ Backlash, $0.004 \begin{matrix} +0.004 \\ -0.000 \end{matrix}$ divided equally between the pinion and gear. Also determine the maximum backlash obtained should the center distance be spread to maximum tolerance permissible.

Pinion

a'	=	0.792 025
$b' \times 1.50$	=	1.026 060
$c' \times 17$	=	.238 094
$d' \times 1$	=	2.952 131
Dividing by pitch	8	5.008 310
AB (no backlash)	=	1.669 437
less min. B	=	0.002
AB maximum	=	1.667 4
less B tolerance	=	0.002
AB minimum	=	1.665 4

Gear

a'	=	0.792 025
$b' \times .50$	=	0.342 020
$c' \times 76$	=	1.064 418
$d' \times 8$	=	23.617 051
Dividing by pitch	8	25.815 514
AB (no backlash)	=	8.605 171
less min. B	=	0.002
AB maximum	=	8.603 2
less B tolerance	=	0.002
AB minimum	=	8.601 2

The drawings are marked with the block measurement data thus

For pinion: $AB/2T = 1.669\ 4 \begin{matrix} -0.002 \\ -0.004 \end{matrix}$

For gear: $AB/9T = 8.605\ 2 \begin{matrix} -0.002 \\ -0.004 \end{matrix}$

This permits a backlash of 0.004 in. minimum to 0.008 in. maximum between gear and pinion with gear centers at minimum distance.

$$g = e'B = (0.002 \text{ to } 0.004) \times 1.461\ 902'' = 0.002\ 9 \text{ to } 0.005\ 8 \text{ in.}$$

$$\text{Depth of cut} = \frac{2.05}{3} \begin{matrix} +0.002\ 9 \\ +0.005\ 8 \end{matrix} = 0.686\ 2 \begin{matrix} +0.002\ 9 \\ -0.000\ 0 \end{matrix}$$

If the operator, after taking a rough cut on the pinion, finds a block measurement of 1.754 in., he deducts the maximum measurement of 1.667 4 in. giving 0.086 6 in.

Since $g = e'B$, the additional cut to take is $0.086\ 6 \times 1.461\ 902 = 0.126\ 6 \begin{matrix} +0.002\ 9 \\ -0.000\ 0 \end{matrix}$

The additional backlash resulting from the maximum tolerance permitted for the center distance is

$$H = hb' = 0.005 \times 0.684\ 040 = 0.003\ 4$$

Added to maximum backlash of 0.008 in., the total possible maximum backlash between gear teeth is $0.003\ 4 + 0.008 = 0.011\ 4$ in. and the minimum is 0.004 in.

Could You Stand Prosperity?—Discussion

A. W. FORBES
Forbes & Myers

Your editorial on this subject (*AM*—Vol. 78, page 772a) is right to the point. Should business improve even to 50 per cent of capacity, how could we handle it? We will not mention full capacity, for that seems unlikely before 1937, but it is entirely possible that half capacity may be required within a year. Where are the men competent to do the skilled work?

In my own business former employees have gone to the farm, to engineering, to the service industries and elsewhere. They will not be available as mechanics, and I see no available supply of men to call upon.

We will need apprentices immediately, with even a moderate rise in business. The Norton Company has made a step in the right direction, but most of us cannot make this step. Our codes effectively prohibit apprenticeship, and the agency for apprenticeship established last June by the President is not yet in operation.

The move now should be to impress upon Washington the need of apprenticeship, to insist that the restrictions be removed, for if this is not done, industry will find its output curtailed by lack of skilled men before much impression is made on the number of unemployed.

How Shall We Get Skilled Men?—Discussion

IRA S. WILLIAMS

Both apprentice and adult training in the metal-working industries deserve serious consideration. In an article under the title given above (*AM*—Vol. 78, page 794), Fred H. Colvin says, "Those who recall 'vestibule' schools during the war realize that much can be done in a comparatively short time." What was accomplished in rifle and shell plants was miraculous. What was accomplished in machine tool plants at that time does not deserve the same commendable criticism. Machining was expedited through the machine tool plants on forced schedules at the expense of quality.

Retrenchment

After the war the munition plants were liquidated, and for the next fifteen years these war-built machine tools cluttered up the used-machine market. After hauling and warehousing expenses were deducted the used-machine dealer who could show a profit was exceedingly fortunate. The machine tool builders found themselves in the peculiar position of having acquired excessive plants and with business falling off more and more each day. They were forced to institute retrenchment policies and the natural result was that apprentice training suffered. In the case of a national emergency today there would not be half enough men to staff the "vestibule" schools in an adequate manner.

In an article under the title "A Task for Old Timers" (*AM*—Vol. 78, page 280), Lucien I. Yeomans speaks of transference of skill from the older men to the younger ones by social contact in the home and in the shop. What Mr. Yeomans fails to take into consideration is the fact that the depression years have seriously affected the skill, morale and enthusiasm of the older workers.

As I see it, the only solution of the problem is for machine tool builders to establish apprentice schools to train apprentices in the use of the equipment they build. These apprentices should be recruited from the various industrial centers and should be given intensive training over a short period. The Federal Government should cooperate with the various machine tool shops and aid them in carrying out an adequate program. This can best be accomplished by educational armament orders.

An Old Timer and His Tools

CHARLES WESLOW

What an all around mechanic needs—in his tool box and otherwise

EVERY tool- and diemaker should own his own parallels, and also a pair of magnetic parallels; both are best when made of machine steel. The former should be pack hardened, ground, and lapped. They should first be machined and all the holes drilled in, heated red hot, and allowed to stand a couple of weeks; then pack hardened, rough surface ground, and allowed to stand several weeks more, heated occasionally, say every other day. Then follows the final grinding, and after occasional heating again, they should be lapped to straight surfaces. Obviously, they should be within 0.0001 in. of being parallel.

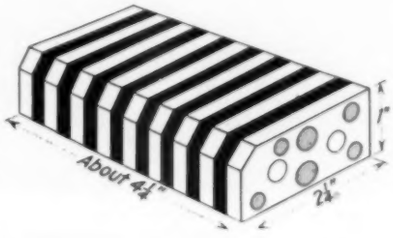
I have five pairs of them ranging in size from ⅝ to 1¼ in. high. In all my experience, I have found that it is not necessary that they be exactly square. I made all of mine 7 in. long, which seems to be a satisfactory length for a mechanic to cart around.

As to the magnetic parallels, they are the surest road to success, if one desires to keep up to the foreman's expectations regarding time on a job. Many shops provide such parallels, but these are usually thrown around carelessly by every Tom, Dick and Harry. And because of the very nature of their assembly, are likely to become warped out of shape from abuse. Thus accuracy has no chance with them.

Many young men seem to think that magnetic parallels have something mysterious inside of them. They are merely layers of cold-rolled or machine steel plates, separated by insulation of the same thickness or less than the metal plates, which form a series of magnetic north and south poles when charged by a magnetic chuck.

When I made mine, I put a 45 deg. angle on them as shown in the sketch. Any tool- or diemaker can readily see the advantage of the angles. In order to eliminate any chance of the plates shifting, from an accidental fall, I took care to do the job right. I used machine (hot-rolled) steel, instead of cold-rolled, because cold-rolled is likely to warp in time, even if it is annealed before finishing. For insulation I adhered to Bakelite of the same thickness as the metal plates, which are ¼ in. thick, 1 in. wide and 2¼ in. long.

I made a simple jig to drill all the holes in each piece separately. Holes, shown in black in the sketch, reduce that much weight; holes for the half hard brass rods are drilled 3/32 in. smaller. After all the holes were in, I surface ground both sides of both the metal and Bakelite plates, and dressed



These magnetic parallels are made of alternate sections of steel and Bakelite held together with half hard brass rods

the edges of all the holes with a scraper to a slight chamfer. Then I made a fixture for the face plate of the bench lathe, in which I fastened every plate, and "bored" all the rod holes square with the surface and reamed them to size, only one hole in each; then, when I put them all together with one brass rod driven in, I reamed the other holes all in one unit, so that I was certain that both rods would fit right.

Then I marked the plates, and took them all apart, and lapped both sides of each plate, so that when I began to assemble, it was like linking Johansson blocks together, by a sliding motion. And believe me, I can let my magnetic parallels fall, and they don't shift.

There are nine pieces of machine steel plates and eight of Bakelite. I would not use any other insulation than Bakelite, because such material does not warp out of shape from heat.

I made mine the height as shown, because most 1½ and 2 in. shanks on punch holders are 2 in. long. Then when I have a job of sharpening a punch or set of punches that must remain fastened to the holder, all I do is get out my magnetic parallels and start right in, without going to the trouble of spending time around the crib checking out the company's parallels or looking for the adapter most firms provide for holding a punch shank. Some other man may be using them on another grinder, so I have my own.

Tool steel is no good to make solid parallels of, because it retains a residual magnetism. Pack-hardened machine steel parallels also retain some magnetism, but nothing in comparison to hardened tool steel. The plates of magnetic parallels are not hardened.

As a precaution, I advise laying a sheet of paper between the parallels, or any other fine job, and the magnetic chuck, so as to be able to remove them without scratching, and I always stone off the surface of the chuck immediately after I dress the wheel. Above all, don't lend out your parallels or other fine surfaced tools. It's like lending your poker to your neighbor, and getting it returned to you in the form of a corkscrew.

I find only about twenty per cent of tool- and diemakers who own a small grinder vise. Herewith is a photo of my vise. It could be better, such as higher and wider, but I seem to get along with it all right. The sliding jaw, however, should have been longer, to prevent it from buckling up when being tightened by the screw.

Such a vise is also made of hot-rolled machine steel, pack hardened, ground and lapped all over to insure a nice job. Don't lend it out. If you do, it will change from a vise to a shoehorn.

Men of other trades know quite well what each other possesses, but not so in the tool- or diemaking "profession." So follow me, and I will show you what I have besides the ordinary tools.

First of all, I made my tool box out of a typewriter case, because it is made of cardboard, leather covered, and light in weight. When I used to travel around a bit, I had one that I made to fit into the closet at either end of a sleeping car. I'd check my baggage, but not my tools, because a man's tools should have first place, next to himself. One night when I was changing from Buffalo to my home town, Newark, N. J., I handed my tool box to the Pullman porter, who when he lifted it, remarked, "Ah knows ware dis goes; it goes in the closet." "Right you are," I retorted, and handed him a Canadian quarter.

I improved the typewriter case, so that it would look like a "regular" job. A bricklayer's or cabinet maker's tools are all much alike, but not so with the tool- and diemaker's; theirs are all different. And many in the latter profession, who have nothing more than a lunch box full of tools, depend on borrowing from others, yet never conceal the fact that they are opposed to men of our trade owning all the tools they possess. I use the company's height gage, but I have my own scratcher. Why? Simply because there are always tool- and diemakers who have no sense of pride toward either company owned tools or their own. Employers, however, seem to like such men in their employ, who "dig fast" into their work, without even wiping away dirt where a table on a milling machine slides back and forth, but such men in the long run are expensive regarding maintenance.

A tool box made from a typewriter case has a place for all the small items that a toolmaker needs

Everything in Its Place

Because of having altered the typewriter case to a square box at the top, I have an angular compartment there, where I keep my vise, 2-in. angle plate, 2-in. V-block, and certain parallels. My angle plate is 2½ in. all sides, and my V-block is 2-in. long, 1¾-in. wide and 2-in. thick. It has a V on each side; one V is ¾-in. wide, and the other is 1-in. wide. It has grooves along the sides to hold a U-shaped clamp having a 10-32 thumb screw thereon. It has five ⅛-in. holes drilled all the way through, to reduce the weight, and is provided with innumerable 10-32 tapped holes all over, for clamping purposes. It is made of machine steel, pack hardened, ground and lapped almost exactly square, all over, and the sizes are within 0.0001 in. Sometimes I use it under a height gage, and sometimes it is used as a gage itself. The V on each side is square with the ends. I have used it mostly on the surface grinder.

If I had a jobbing shop, I wouldn't make a pair of magnetic parallels like mine for less than $50; I wouldn't make a V-block for less than $30, a vise for less than $35, nor an angle plate for less than $25. I never lend any such tools, not even to Angel Gabriel himself. That is why they are in as good condition as when I made them some 30 years ago.

The top drawer in my tool box is angular shaped because of the change in the shape of the typewriter case. There I keep my stones, of all sizes and shapes. I lent a stone, that took a lot of time to grind down to a small thickness, to a man whom I thought would be as careful as myself, but in less time than it takes to tell it, he broke it, brought it back to me with a promise he would supply me with another. I'm still waiting for "another" since the year 1914. This drawer, like all the other drawers, is provided with partitions made of ⅛-in. thick quartered oak. In the right-hand bin, I keep my indicator, small dividers and small calipers; two dividers—one for fine lines and the other for rougher work. Small outside and inside calipers do not come ready to use. You have to stone off the measuring points nice and round, to meet all the sizes they are intended for.

The next drawer down has four bins. One bin contains dowel punches, from 1/32 to ⅜ in., hardened all over; also swedging punches, that are essential to have handy when it is necessary to swedge over or in the cutting edges

of an annealed die up for repairs, or sometimes on punches, and even sometimes on a new job, when the foreman isn't looking.

None of these tools are over 2 in. long. I have a couple made of 5/16 in. toolbits. The next bin contains a dozen small flat chisels, some cape. The adjoining bin contains round-nose chisels, all sizes. None are more than 4 in. long, and are made of $\frac{3}{16}$ and ¼ in. square steel, hardened on both ends, the same as steel engravers have them. I learned how to make such chisels when I attended Pratt Institute, in Brooklyn, in the years 1901-03, where I took up an evening course in die engraving, having been employed in the Mergenthaler plant nearby.

Double Duty

We were taught by a Frenchman to file the chisels to shape at both ends—not forged. For a few years after my instruction there, I became employed at force making in a jewelry shop in New York, and also operated a Keller engraving machine. And that isn't all; I simultaneously had a job singing in a choir a block away, and got $40 a month for singing and $5 for a funeral. When they happened, I was handy to get because of working nearby.

In the other bin are my cutting broaches, used for removing the material left between drilled holes in dies or anything else. These range from $\frac{3}{32}$ to ¼ in. thick, and some are longer than others. Some are made of 5/16 in. high-speed tool bits, which stand up very well.

In the center drawer down, are all kinds of knickknacks, including lead pencil, chalk, prussian blue, steel balls and small collars, useful in more places than can be imagined by anyone not in the trade.

On the left of this drawer are two smaller drawers, in the top of which are various sized pieces of ground stock, some hardened, and some soft. It takes years of practice before one gets the proper accumulations of such junk, but I wouldn't sell that drawer full of junk for $50. Such small pieces are invaluable; some are 0.100, 0.099, 0.101 in. and so on, all thicknesses up to 5/16 in. and none more than an inch or so long. In the small drawer underneath are small taps up to ⅜ in. While some men with lunch-box tools are spending time up at the crib for the use of the company's drills and taps, I am getting the holes drilled and tapped, and with good taps. When these get worn, I exchange them for newer ones, at the crib one way or another. Also in that drawer are a few tool bits that are side cutting.

In another drawer, I keep round-nose tools bits; thus, it is easy for me to grab quickly what I need. On the right of the center drawer are two smaller drawers. In the top, I keep my 3-in. square, and 1- and 2-in. micrometers. In the small drawer underneath, are my B. & S. ground-stock small parallels; a couple dozen of them from ¼ to 1 in. high, and various thicknesses. They are all surface ground nicely, and none is over 3½ in. long. In the front of the drawer I keep my two die squares. One square is ready to adjust to any angle, and the other can be adjusted, but I always keep it square. Both are home-made, and I wouldn't sell or reproduce either for less than $5 apiece.

In the perforated drawer next down are my scales, from ½ in. up to 12 in.; all kinds of feeders, thread gages, small protractor, bevel gages, two of them, one 3 in. long and the other 1 in.; jeweler's saws, instrument maker's hacksaw blades; all my prick punches, six of them. I see other men trying to get along with just one prick punch—ridiculous. But they are the kind of mechanics they hire nowadays, and us old timers have to sit back and think.

In the next drawer down are 4-in. calipers, inside and out, two of each; drill gages, small files that are active and adjustable parallel blocks. These are handy blocks; I bought mine, and did them over again to make sure of greater accuracy.

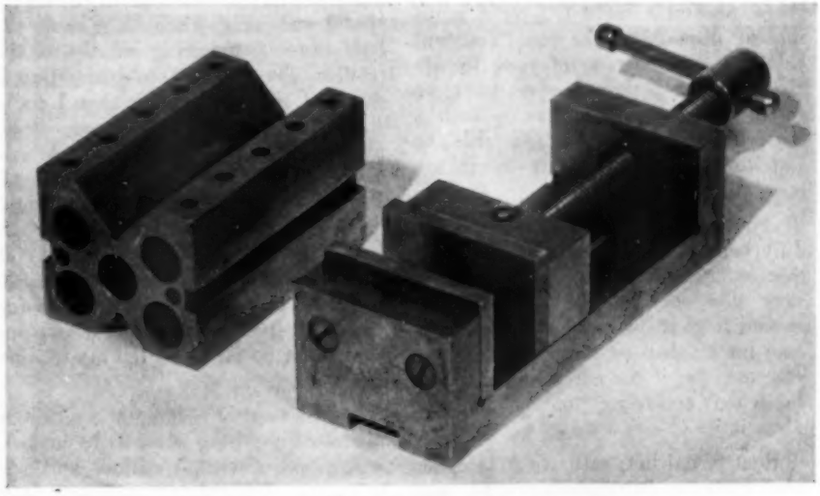
The next drawer down has five bins. One bin contains letter size drills but not all sizes; some sizes are not necessary. Another bin has drills from $\frac{1}{64}$ to $\frac{1}{32}$ in. ranging $\frac{1}{64}$ in. in size. The center bin has my 6-in. long, ½ in. square oilstone that I use for stoning tool bits. Also there are half a dozen chisels, made of ⅜ in. hexagon stock, and a few boring tools. In the other two bins are my counterbores, of various sizes, for screw heads and other purposes. The company is supposed to supply such tools, but what good are they after some of these lunch-box toolmakers have used them at high speeds?

The bottom wooden drawer contains my set of number size drills, small scrapers, offset screwdrivers, larger calipers, diamond and small piercing hole broaches in a small cardboard box.

On the bottom of the box are two drawers made of sheet brass; in the one at the left are about four dozen files from 4 in. up to 6 in., all assorted, no two alike, and some are ground narrower than can be purchased; also a few leather handles. In the brass drawer on the right are five dozen needle files, some short and some long. That is about all in that box.

How can a man get along without tools essential in the industry? They tell me that in Belgium toolmakers are supplied with company's tools to work with. Fine, but if I were in Belgium, I would want my own tools anyhow; then I'd know what I have to work with is in A-1 condition.

I have a fiber suitcase in which I keep my screw drivers, tin boxes of extra tool bits, laps, cold-rolled paral-



Both vise and V-block are made of hot-rolled machine steel, pack hardened and lapped

lels, clamps of all kinds, monkey wrenches, large boring tools made of high-speed steel, some pieces of letter size drill rod and some right to size standard size (hard to get); two pair of hack-saw frames, one with medium teeth and the other fine teeth, an instrument maker's saw and jeweller's saw, extra small hammers, large calipers, small pipe wrench and several pliers. When I pack my apron, towel and hand soap, ready to move to another job, the suitcase is full. The shop perhaps provides a drawer under the bench, but I keep only company owned files in it and other company owned material. If they provide a cabinet of drawers under the bench, all well and good, providing there is a lock on it. Even so, I refuse to work if I cannot have my tool box on the bench where I can find my own tools readily.

Rather Lend Cash

All my screw drivers are made so that they do not slip out of a screw slot, and I can use my small monkey wrench on the larger sizes. My outfit of screwdrivers amounts to ten altogether. Do you think I would lend out any of them? Not on your life, because they usually come back broken. I made most of them, and after I hardened them, I tempered them so that they stand up better. They wear quicker, but I would rather file them to shape again, than have them break. Lend out laps? It may be all right to lend out coin, which may come back worn, and still retain its value as money. As long as drivers give thumb riders a lift, thumb riders will exist. And as long as toolmakers lend out their tools, borrowers will exist.

Some day you young readers who travel around a bit will have a reminiscent disposition like me. You will think fondly of some of your former shop mates, perhaps never to meet them again. I wouldn't swap such a disposition for an airplane ride to Paradise.

If a die is made of oil hardened steel it can be altered without rehardening. Just heat it to an invisible red heat, and let it cool in the air. Then at a very slow speed, material can be removed from it, by using a carbon steel tool bit or drill or boring tool as the case may be, if the carbon steel tool is hardened according to my formula. Here it is:

Heat it red hot; saturate it in cyanide, immerse in soldering acid, and draw the temper to a light straw. Sharpen and stone to a fine cutting edge; no need to reharden the die, as it will cut and draw just as good as when it was first hardened, unless the stock it cuts is very heavy.

Do the same thing to a drill, if you have any springs, such as are used in the main spring in a clock, in which you want any holes drilled. If you want to hold on to your job, don't be smarter than the foreman. Try and know nothing but what he tells you.

Several times in my career, I showed the foreman how to do some of the work under his supervision, but I always got it in the neck for being too smart. Recently, a boss himself hired me as a model maker on toys. In relating to him my process, that I originated in another similar factory in the year 1919, he took keen interest in my scheme, and admitted that he never saw my method executed before. He gave me the job, and after a few days, told me to go ahead making a wax model of a now prominent metal mechanical toy.

The foreman couldn't imagine how it came that the boss himself gave me the orders. In my own studio I made the wax model of what he wanted, and brought it in to him the next day. After a week's time he came to me, and said, "That's a very good idea of yours and works satisfactory." Do you think the foreman liked me after he found out what it was all about? When it came laying off time, I was the first.

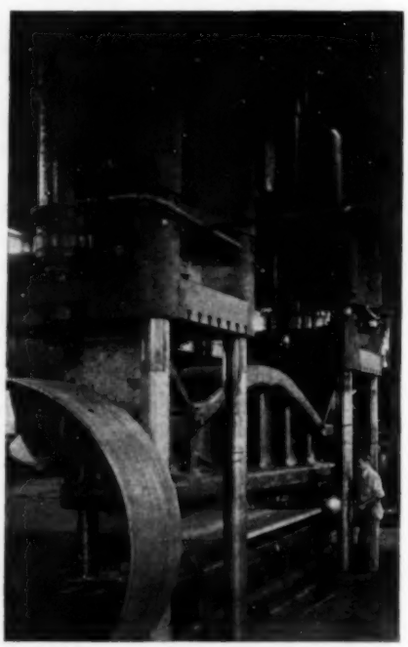
Straightening Cast Iron

In another jobbing shop, the foreman told me to scrap a lot of small cast iron levers, which he said were warped out of shape too much. I replied to him that I could straighten them easily. He retorted sarcastically, that I was crazy, when along came the boss himself, inquiring what was the trouble. The foreman told him that I was fool enough to think that I could straighten the cast iron levers, which averaged ¼ in. thick, ⅞ in. wide and about 8 in. long. Said the boss, "If Weslow says he can do it, he can." (The boss and I worked together years before he went into business, which the foreman did not know). I straightened the pieces all right, but in a few days the foreman rode my neck, and even went so far as to tell me to quit; out I went.

My method of making a sheet-metal model of anything small is to make a wax model of what is wanted, and take it to an electroplater who will plate the wax with copper to any thickness wanted. Out comes the wax under heat, and there we have the model.

That reminds me of the time in 1902, when I was employed in the old Sloan & Chase Company in Newark. When summer came, I told Mr. Sloan that I wanted a vacation for two weeks because I was not feeling so well. We talked it over, and finally he consented to let me off. He never knew that I had an extra tool box and extra tools. I got a job at the Fay Watch Company, at Sag Harbor, Long Island, known as a summer resort. In the evenings, Saturday afternoons and Sundays, I rode along in a leg-a-mutton sailboat of 18-ft. length that I hired; over to Shelter Island, fishing, swimming and everything.

My two weeks up, I told the foreman in the Fay plant, that I was homesick, and wanted to go back. I got my money, and on the following Monday went back to Sloan & Chase at my regular job. I worked there two years, and told Mr. Sloan that I was quitting for a better job. And as I was getting packed up, I told him about my vacation. He came back at me saying, "If you are smart enough to play a game like that on me, you are smart enough to have two heads instead of one and get the one that is on you cut off."



Courtesy U. S. Bureau of Reclamation

***Pipe Press*—Babcock and Wilcox uses this 3,000-ton hydraulic press in its Boulder City, Nevada, plant. Here initial bends are made in steel sheets to be made into pipe sections such as shown to the left**

EDITORIALS

VOLUME 79 AMERICAN MACHINIST ESTABLISHED 1877 McGRAW-HILL PUBLISHING COMPANY, INC. NUMBER 6

K. H. CONDIT F. H. COLVIN
EDITORS

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Back to Washington

RIGHT NOW Congress is considering legislation that is unprecedented in its effect on businsss. It is attempting to outdo the Administration in the scope of its reforms and yet, surprisingly enough, business men are apathetic.

Perhaps they consider that they spent enough time in Washington during the hectic days of code formulation; perhaps they have a paid representative in Washington to guard their interests; or perhaps business has improved enough so they can sojourn in Florida. Whatever the cause, with the exception of a few who have given unstintingly of their time, business men are avoiding the Capitol at a time when their presence is most needed.

Congress has before it bills to revise the Recovery Act, to regulate labor relations, to provide social security, to limit holding companies, to spend $4,880,000,000, to boost corporate profit taxes, to restrict the working week to 30 hours, to say nothing of many pet schemes far more radical. Proponents of these measures are on hand to present their arguments in support of these bills and to do their best to insure their passage. Yet when industry's turn comes to defend its interests, direct testimony on the part of manufacturers it is noticeable only by its absence. It is bad judgment to allow so much pressure to be applied from one side without at least attempting to counteract it.

Industry will have to pay the bill; it is the principal target of all of these stupendous reforms. Yet, industrialists in general are depending upon their association executives, Washington attorneys, or upon the President himself to defend them against kinds of legislation or amendments which will be distinctly detrimental to them.

DOINGS IN Washington today make the writing of codes seem trivial in comparison. The original Recovery Act was a temporary expedient while most of the current bills are for permanent legislation. Yet industrialists who stayed up all night in Washington hotels compiling codes are willing to watch the present Congress from afar.

Our Federal legislative bodies are hesitant. The minds of many of their members are pervaded by a wholesome skepticism as to whether prosperity can really be restored by statute. These men are in a mood to welcome the opinions of their constituents, making such opinions, coming at this time, doubly effective.

It's not too late for action even now. But don't wait and don't leave it to someone else.

Inconsistency

CONGRESS is now considering a public works appropriation of $4,880,000,000 to provide temporary employment and relief for the coming fiscal year. It is generally agreed that spending at this rate cannot continue indefinitely, that private enterprise must soon take its share of employment. Yet concurrent with the bill carrying this huge expenditure are others which directly retard reemployment by preventing industry from proceeding with confidence.

We do not quarrel with proposals directed toward the abolition of admitted evils which have besmirched business ethics, but this is a poor time for "reform" moves whose sole purpose is to recast our economic structure into the mold of a theorist's vision. There is no evidence to show that the economic trend would improve were large corporations compelled to disintegrate as a result of Congressional attacks on bigness where no question of monopoly is involved. On the contrary, there is every reason to believe that such efforts will cause a drying up of industrial purchasing that will reduce employment in the capital goods industries where it is admittedly most needed.

If the millions of workers still idle are to be returned to productive jobs there must at least be a concerted move toward this end.

Traditional Methods

THERE are few machine shops where new machine tools are not sadly needed. But in many plants shop men only think in terms of increased speeds when improved methods may be just as necessary. Just because a job has always been made on the lathe is no reason that a new lathe is needed.

It is even more difficult to get men to consider changing their methods than to think about buying new equipment. Tradition, which is frequently only a fancy name for staying in a rut, is largely responsible for this condition. Experience which can be of such great value frequently becomes a handicap.

The older the industry, the greater the likelihood of hampering traditions. The same holds true for older men in any line of work. This inertia is even more of a handicap than a slowing down of pace in high production shops. For this reason it often happens that men who have a broad basic knowledge but no actual experience in a given line frequently develop new methods of a revolutionary nature, methods which men long in the field knew (?) to be impossible.

. CHIPS .

Washington—Torrid words and angry retorts reflect the fact that New Dealers in the Senate will no longer stand by and see their pet views and heroes berated . . . Credit is given General Johnson for precipitating the flare-up in his New York speech which attacked Huey Long and Father Coughlin, on one hand, and members of the old guard who encourage them, on the other . . . NRA's future is again clouded by adverse court decisions and by the resignation of Clay Williams, head of the National Industrial Recovery Board, after persistent attacks by Labor . . . District Court victory of the Weirton Steel Co. badly bent Section 7a, when Judge John P. Nields ruled that the company's relations with its employees were not interstate business . . . Attorney General Cummings plans a prompt appeal . . . Pushed ahead by the House the $2,100,000 bonus bill may see quick action . . . With the legislators talking billions, the veterans want to get theirs . . . The nation mourns the passing of a true liberal in the death of former Supreme Court Justice Oliver Wendell Holmes.

Foreign—To celebrate the Saar's return to Germany, Hitler welcomes new amity with France . . . But Britain increases defense funds $47,600,000 over last year with accent on the air and water when Hitler's "cold" defers arms parley . . . 4,000 foreign visitors visited the Leipzig Trade Fair last week.

Finance—Break in the British pound disturbs foreign exchanges . . . Roosevelt declares for higher commodity prices but denies present plans for dollar devaluation . . . Richberg "guarantees" no monetary inflation during the next six years.

Industry—Secretary Perkins hails gains in employment with payrolls back to three-fourths of 1929 based on a survey of 90 industries . . . Relief, however, reaches a new peak with 22,000,000, or a sixth of the population, on the rolls at a cost of $5,000,000 daily . . . An interchange of executives between business and government is proposed by Secretary Roper . . . Henry Ford predicts that wages in this country will reach a new high.

Indicators—*Business Week's* index again falls, reaching 61.7 . . . Bank clearings rise 8 per cent over previous week . . . January exports advancing against normal seasonal trend were $4,000,000 over 1934 . . . Power consumption for the week ended March 2 was 4.6 per cent over last year and near the 1930 level.

Battle Looms Over Future of Recovery Administration

WASHINGTON—On the occasion of its second birthday, the New Deal finds itself at a critical phase. Its economic achievements have fallen far short of what was confidently expected in its vigorous first year. As in the case of Donald Richberg's testimony before the Senate Finance Committee, which is investigating NRA, its spokesmen admit mistakes in legislation and administration.

The New Deal, as expressed by Rooseveltian policies, is beset on two sides—by those who would bring expenditures in line with Federal income, face further temporary deflation in the belief that this action would release a flood of deferred private industrial investments and by those who would go much farther than the Administration has done, by following Huey Long or Father Coughlin. These lines of demarcation will tend to become well defined political issues.

Some Bills Merely Threats

Enough anti-business legislation has been presented to Congress to renew apprehension after a good start by industry in 1935. The worst of these bills, such as Senator Wheeler's move against bigness, will probably not be passed. If industrialists could distinguish between real legislative efforts and bills introduced as potential political fodder, they would feel much happier. But they will be unwise to take too much for granted and assume that proposals that seem to them outrageous have no hope of passage. Presentation of facts for industry's welfare now may save many headaches later.

Richberg's seventeen proposed charges of NRA are much in line with expectations, and if carried out will limit rather than extend the scope of its activity. As originally conceived NRA proved unworkable; only simplification and exclusion of small intrastate businesses will save it. The Weirton and other adverse court decisions show clearly that some basic elements of the old law are likely to run afoul of the Constitution.

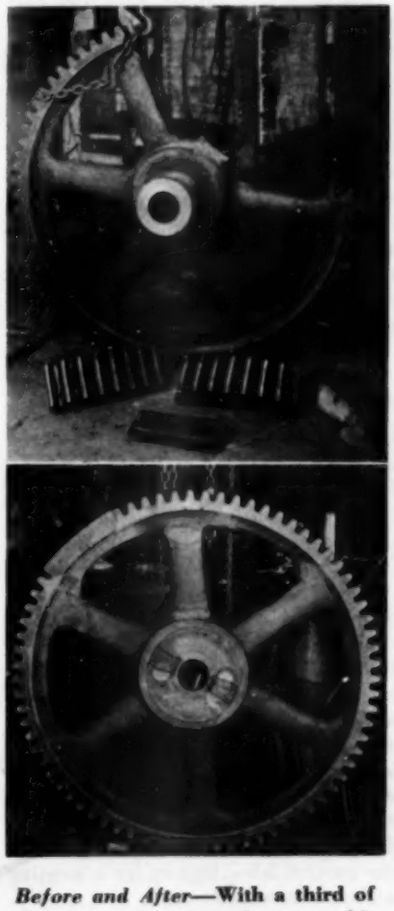
After only two days of hearings the Senate Finance Committee turned abruptly from its inquiry to draft new recovery legislation, despite the feeling of some of its members that every angle of NRA should be probed. Such action would mean weeks of delay.

Senator Nye, one of the sharpest critics of NRA, asserted that he would introduce a bill transferring many of its activities to the Federal Trade Commission. Senator Borah interrupted consideration of the War Department appropriation on the floor of the Senate to defend the small business man now struggling with codes written "by large industries for large industries."

So seemingly future recovery legislation will not rest entirely with the committee but will be carried to the floors of Congress; the battle will be abetted by constituents who share the popular reaction against NRA and all its works. Strangely enough some industrialists who bitterly fought "regimentation" two years ago are now seeking its continuance.

As consideration of social legislation progresses complications thicken, particularly in connection with unemployment insurance. Agricultural laborers and domestic servants have been exempted, as have concerns employing less than ten persons, but there are so many other difficulties to iron out that little prospect for final passage until late in the session is seen. Federal-state old age assistance is offering no such trouble and will go through minus the fantastic Morgenthau proposal to build up 50 billion reserve.

Repeal of the income tax publicity requirement seems probable. Handling of the bill in the House indicates Administration support. There will be a fight in the Senate but approval is foreseen. Reluctance of Senators to make public their own returns and the returns of some of the leaders of their party is likely to influence votes.



***Before and After*—With a third of the rim and one spoke gone this 2500 lb., 7 ft. diameter gear looked pretty hopeless. But the Menna Welding Co., of Toledo, successfully salvaged it with the aid of G. E. equipment**

Charles R. Hook Speaks On 30-hour Week Bill

In a radio broadcast on February 28, Charles R. Hook, president, American Rolling Mill Co., pointed out some of the pitfalls involved in the Black 30-hour bill now before Congress. Mr. Hook stated that instead of aiding recovery this bill would drastically interfere with that objective and cripple the purchasing power of American workers.

Taking experience in the steel industry as an example, he said that the average week last year was only 29.7 hours, although the code for this industry provided a maximum work week of 40 hours. If a 40-hour bill were passed, Mr. Hook contended, workers would secure less than 24 hours employment per week with no opportunity to recoup their losses through overtime in periods of better business.

He further showed that further reductions could not be made without compensating increase in rates of pay of about 33⅓ per cent above their present levels. Added to the wage cost for the steel industry as a whole applied to the 17,500,,000 tons produced in 1934, this amounts to $185,000,000. Inasmuch as the steel industry suffered a loss of more than $60,000,000 last year, Mr. Hook claimed that the added cost must be passed to the consumer as increased selling price. This would restrict the use of steel in this country and shipments abroad, decreasing the employment in the industry.

Machinery Prospects Brighten As Detroit Schedules Hold

DETROIT—January factory sales of 292,765 cars and trucks are reported by the Department of Commerce. Retail sales for January, running 140 per cent above last year, are estimated by R. L. Polk & Co. as about 175,000 on incomplete returns. February production is stated to be 350,000, with March expected to be better.

Ford's March schedule is up from 130,000 to 160,000 and every effort being made to get to 6,000 per day. With die trouble adjusted at Chevrolet and realignment of models caused by the introduction of a lower priced coupe and two-door sedan at Plymouth, these volume producers should boost March totals. Chevrolet schedule is expected to reach 110,000 in March; Plymouth has averaged around 1,800 per day with a capacity of 2,300. Dodge will try for 1,000 per day as a test to prepare for expected heavier demand. Olds and Pontiac are making record outputs with two shifts generally and three in some departments.

Sales Still Advance

Back orders substantially as high as a month ago are reported by many companies, and a shortage of the touring sedan models with trunk attached is general. Olds retail sales for the first 20 days in February were higher than any similar month. Chrysler as a whole sold more cars in February than any previous February in the company's history. These random samples indicate sales still on the upgrade, which seems to be general for all companies. Foreign business in 1934 reached $196,314,485 as compared with $93,968,383, or 143,916 units as compared with 63,754 in 1933; meanwhile arrangements are being made for the distribution of a small Japanese car in South America which sells for $285 f.o.b. Osaka, a threat to American exports.

Tool and die shops show a slackening demand for workers; no layoffs, merely a slackening in the rate of increase. The electric load in Detroit, symptomatic of motor activity, increases week by week, but at a slower rate than a few weeks ago.

Production tool business is heavy as expected with current production schedules. One company with widely used products reports business in 1934 over 130 per cent greater than in 1933; January sales were 25 per cent over December. Machinery houses which enjoyed substantial business in January have experienced a general lull in February. However, bright spots are to to be noted; sales to March 1 are reported in some cases of over half of the 1934 total. Requests for quotations on standard machines and replacements are increasing. Two 1936 designs, reported past the board stage, are expected to be a factor of importance in the next few weeks.

Shift to the eight-cylinder engine, evident in the last few years, is likely to result in machinery buying if more converts are secured. The 12 per cent of eights in 1930 jumped to about 40 per cent in 1934, due largely, of course, to Ford. While revamping from the four to the six is possible, when the step is taken to the eight the capacity of old equipment is exceeded.

Likelihood of profits with the current rate of output and the keenness of competition, together with the fact that several plants have bought little in the past five years, are strengthening the hands of the master mechanics in the drive for cost-reducing equipment. Body production has been modernized during the past two years, and engine and chassis are due for their turn. It is the practice in some divisions of the industry to alternate extensive changes in these two major divisions from year to year.

Labor Prospects

As elections continue, it is evident that workers outside Detroit, as well as those employed in Detroit plants, have comparatively little interest in labor organizations. This attitude is due in large measure to the fairness and impartiality of the Auto Labor Board. At the Lansing plant of Fisher Body, 510 out of a total of 2,607 workers were members of unions, 383 of which belonged to the A. F. of L. It was in this plant that a strike of sanders held up production a few weeks ago.

A strike vote of the 176 locals affiliated with A. F. of L. in the industry was taken beginning March 1, to be completed by the middle of the month. This is a preliminary to a request on the part of labor leaders for a meeting with car manufacturers.

This vote, in view of the unsatisfactory showing of union labor, can be regarded as an attempt to placate the more radical elements in the Federation. Meanwhile demands for a closed shop presented to Fisher Body officials in Cleveland have been rejected with the statement that operations would be curtailed in that city unless agitation among otherwise satisfied employees is lessened.

More than 150,000 square feet of floor space in the Hamtramck plant of the Briggs Manufacturing Co., will, when layout and arrangement is completed, be devoted to the manufacture of pressed steel plumbing supplies. This development, the culmination of two years of experimental work, is to be completed April 1.

A plan of salesmen training which is expected to cover all dealer forces in the Ford Motor Co. in 1935, has just been organized. Instructors, taken from the 34 branches are given an intensive course at Dearborn, after which dealer salesmen will be accommodated in each branch.

The Dodge Plant is currently delivering 120 to 150 units per day on a 5,000 truck order for the motorization of the Army Transport Service.

McGraw-Hill Editors Study Industry Abroad

Two editors of the McGraw-Hill Publishing Co., Kenneth H. Condit, of *American Machinist*, and Marc A. Rose, of *Business Week*, are now in Europe making a study of business and industrial conditions. After leaving on the S. S. Europa, which sailed on February 22, they spent the week ended March 10 at the Leipzig Trade Fair, in Germany.

Mr. Condit's itinerary includes Berlin, Hannover, Essen, Chemnitz, Duisburg, Dusseldorf and other industrial centers in Germany where he will make a survey of modern German machine methods and labor conditions. He plans also to go to England to study the methods enployed in plants in London, Birmingham, Coventry and other centers. In addition to his travels in Germany, Mr. Rose will visit Vienna, Austria, Italy, Switzerland and France.

Chilean State Railways Buying New Equipment

Ten locomotives and tenders from the United States have recently been received by the Chilean State-owned railways, according to vice-consul C. L. McLain in a report to the Commerce Department. Twenty-five additional passenger and freight locomotives have been ordered from German builders.

Exports of Machinery for 1934 Show Increase of 78 Per Cent

WASHINGTON — Improvement in the world business situation and the corresponding gain in industrial activity in 1934, although small, has been marked by a substantially improved demand for American industrial machinery. Exports of machinery during the year amounted to $98,348,000, a gain of nearly 78 per cent over the 1933 total of $55,284,000, according to E. V. Needham, Machinery Division, Department of Commerce. The growth during the year was steady, and may be considered to be on a sound basis. The devaluated dollar was of considerable assistance.

While statistics covering the trade by countries of destination are not yet available, certain definite conclusions may be drawn from the accompanying table showing exports of the seven main groups of industrial machinery during 1934, 1933, 1931 and 1929.

Europe Buying More

During the year, the greatest strides were made in the power-driven metal working machinery, which is made up almost exclusively of machine tools. This recovery indicates that our best machinery customer, Europe, is coming back to economic well-being. The excellent showing of the textile machinery group also indicates improved conditions, particularly in consumer buying power, which has made machinery buying feasible.

The recovery in mining, well and pumping machinery points to growing prosperity of producers of raw materials. Outstanding in this connection is the improvement which has been made in the Union of South Africa. Figures are not yet available showing the improvement in the market, but indications point to a large increase in purchases from the United States.

Among important items in "Other Industrial Machinery" are sugar mill machinery, paper mill machinery, bottlers and brewers machinery, steam specialties, air compressors and refrigerating equipment. Any gain in purchase of these machines may be directly attributed to an improved business situation.

The excellent gain in the year's trade was accomplished with little or no direct artificial aid. The Russian business failed to materialize and seems definitely out of the picture for the immediate future. The reciprocal trade agreements have been only recently completed with but two countries, Cuba and Brazil. It is too early yet to measure the effect of the agreements with these countries.

Perhaps the most disturbing factor in the machinery export trade during 1934 was the lack of long-term credit facilities. The years of depression had so depleted the surpluses of machinery manufacturers that it was virtually impossible for them to finance many orders which would have been theirs for the asking. Foreign competitors were quick to take advantage of their opportunities in this respect and they secured numerous good orders for all types of machinery simply by granting credits, in many cases up to ten years.

MAPI Survey Discloses Huge Machinery Demand

According to a study conducted by the Machinery and Allied Products Institute, there is a pent-up demand for machinery, accumulated during the depression years since 1929, amounting to a total of $18,574,000,000. To manufacture this equipment would require a payroll to labor amounting approximately to $12,073,600,000 and involve 20,123,000,000 man-hours of labor.

The survey was based on replies to a questionnaire distributed among the membership of 58 machinery trade associations, composing the Institute and covering approximately 90 per cent of all the machinery now being produced in the United States.

Exports of Industrial Machinery

(Value in Thousands of Dollars)

	1934	1933	1931	1929
Power Generating Machinery, except Electric and Automotive	6,598	3,845	12,671	29,091
Construction & Conveying Machinery	5,533	2,813	12,371	26,485
Mining, Well & Pumping Machinery	24,201	13,504	25,256	54,449
Metal Working Machinery, Power Driven	19,434	8,158	36,027	33,439
Other Metal Working Machinery	2,345	1,211	4,003	7,365
Textile, Sewing & Shoe Machinery	15,449	9,825	12,716	27,834
Other Industrial Machinery	24,788	15,926	39,106	89,157
Total	98,348	55,282	142,150	267,820

• INDUSTRIAL REVIEW •

• Machinery orders continue to maintain a higher level than business sentiment. Apparently the upward cyclical swing seems stronger than the fear of bad news from Washington. Not that there is any general expansion of sales, but there is an irregular demand which would be sufficiently large to promote confidence were it not for the newspaper headlines originating at the Capitol.

• The first quarter promises to be the best since 1930. Both Boston and New York are finding it so, with inquiries active and some orders coming in. Concerns which have not spent a cent for four years are buying equipment. Inquiries good in size and volume are being received in Philadelphia, but buying is cautious. Large mill equipment orders in Pittsburgh have not as yet extended to machine tools.

• Things are slower in Cincinnati and unchanged in Cleveland. Toledo, Detroit and Chicago are the brightest spots in the country with orders coming in and more prospect. With automotive plants hitting their stride in production, supply business has increased in volume. Standard tools for replacement are in demand and special equipment continues active. These three centers are considerably ahead of last year.

• In Milwaukee the volume is steady but competition is keener, making it difficult to maintain profits in the face of higher material and labor costs. St. Louis feels a slight let-up, but prospects seem bright on business ahead despite adverse state legislation.

• On the Coast there has been a fair improvement in both San Francisco and Seattle. Some plants are busier than they have been for several years, and there are indications that industry will gain further in the next 60 to 90 days.

Implement Exports Show Improvement

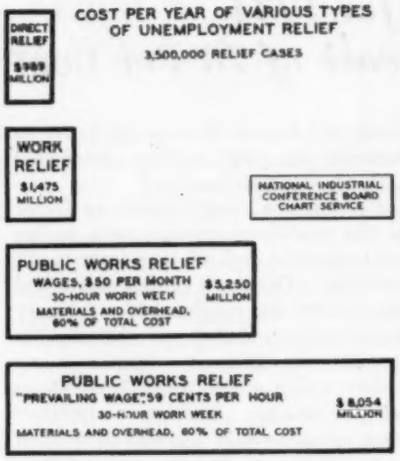
Foreign shipments of agricultural tools and machinery registered a gain of 57 per cent in January over the corresponding month of last year, and were 4 per cent above December. For the three monthly periods export values were $1,728,890, $1,102,952 and $1,667,392 respectively.

Tractors and parts made up the bulk of the exports and their value totaled $1,123,278 compared to $643,990 a year ago. Cultivating implements were valued at $231,382 compared with $146,776 for January, 1934. The large increases in this classification occurred in cultivators, planters, drills and seeders.

Czech Machine Exports Increase 57 Per Cent

A report to the Department of Commerce, from Commercial Attache Sam E. Woods, shows a 57 per cent increase in Czechoslovakia machinery export trade as compared to the 1933 total. The shipments, however, were 60 per cent under the peak year of 1928.

Of the total value of exports in 1934, sugar machinery amounted to 16 per cent, textile machinery 10 per cent, presses 5 per cent, steam engines and turbines 4 per cent. Imports of machinery into Czechoslovakia during the past year increased 35 per cent to a value of 176,344,000 crowns. Textile machinery accounted for 30 per cent of the total imports.



Conference Board Appraises Relief

Based on average cost of direct relief per case during the third quarter of 1934, at the rate of $280 per year, the total cost for 3,500,000 cases would amount to $989,000,000, according to a report by the National Industrial Conference Board. Since the average cost for work relief during the same period was about $35 per month, continuous employment for this number of persons for a 12-month period would cost $1,475,000,000.

The report also points out that the public works bill now under consideration before Congress, covering an estimated total cost of $4,000,000,000, will fall short of the actual amount needed by $1,250,000,000 if past experience on materials and overhead is used as a basis. Substitution of the prevailing rate of wages more than doubles the amount provided in the appropriations bill.

Average hourly wages on public works projects reported by the Bureau of Labor Statistics for the month of November was 59 cents per hour. At this rate, with a 30-hour week, and a 60 per cent cost of overhead and materials, the total for full-time employment reaches $8,054,000,000. If the appropriation is limited to $4,000,000,000, this sum would provide constant employment for 3,500,000 workers for not more than six months.

Exports of Machinery During January, 1935

	January 1935	December 1934	January 1934
Electrical machinery	$5,489,207	$5,865,864	$4,531,567
Power generating machinery (except automotive and electric)	617,406	589,671	422,161
Construction and conveying machinery	532,755	467,978	322,713
Mining, well and pumping machinery	2,178,156	2,404,071	1,301,506
Power-driven, metal-working machinery	1,430,974	1,656,687	1,188,715
Other metal-working machinery	166,878	179,057	125,802
Textile machinery	522,315	759,318	637,524

Exports of Metal-Working Machinery During January, 1935

	January 1935	December 1934	January 1934
Engine lathes	$32,054	$41,732	$84,754
Turret lathes	38,239	39,700	17,105
Other lathes	44,426	25,469	19,091
Vertical boring mills and chucking machines	27,832	91,171	23,638
Thread cutting and automatic screw machines	42,997	51,379	56,760
Knee and column type milling machines	46,775	53,413	19,095
Other milling machines	75,554	102,485	76,981
Gear cutting machines	70,909	74,528	55,134
Vertical drilling machines	65	5,542	25,426
Radial drilling machines	11,274	12,467	4,374
Other drilling machines	37,241	89,581	30,879
Planers and shapers	21,230	28,672	15,707
Surface grinding machines	52,095	17,156	32,946
External cylindrical grinding machines	62,867	65,067	98,849
Internal grinding machines	51,201	95,245	81,807
Tool grinding, cutter grinding and universal grinding machines	65,524	42,246	57,618
Other metal-grinding machines	34,008	38,338	86,258
Sheet and plate metal-working machines	151,453	111,511	106,617
Forging machinery	243,664	135,147	66,385
Rolling mill machinery	105,280	239,884	56,281
Foundry and molding equipment	27,080	30,830	17,308
Other power-driven metal-working machinery and parts	189,246	265,134	155,702

Other Metal-Working Machinery

Pneumatic portable tools	50,805	50,407	26,757
Other portable and hand or foot operated metal working machines and parts	57,562	53,017	46,765
Chucks for machine tools	7,898	10,149	3,724
Machine operated pipe and thread cutters, stocks, dies, taps and other machine-operated cutting tools	25,033	46,005	31,647
Other metal-working machine tools	25,580	19,479	16,909

Reciprocity Agreement Signed With Belgium

On February 27, the third of the trade agreements under the new reciprocity tariff policy was signed with Belgium. Both countries agree that they will grant to no other nation any concession not extended to the other on any product whether or not specifically mentioned in the new agreement.

Belgium, despite its small size and population, is a relatively important market for American exports, total sales in 1933 being $43,300,000 and in 1934, $49,800,000. Last year it was our ninth best market.

More than one-third of the exports to Belgium are benefited by the agreement. The principal metal products on which Belgium grants concessions are automobiles and parts, office machines, radio receiving sets and tubes, and miscellaneous industrial products. Belgium grants a reduction of 15 per cent on cars weighing over 1,150 kilograms, which includes nearly all American cars.

Engineers Discuss Professional Status

On March 7, the Engineers' Council for Professional Development, which represents seven national engineering societies, met in New York to review its aims and achievements. Gano Dunn, president of the J. G. White Engineering Corporation, presided. Speakers were Dr. C. F. Hirshfeld, chairman of the Council and chief of research, the Detroit Edison Co., General R. I. Rees, assistant vice-president of the American Telephone and Telegraph Co. and Professor J. W. Barker, dean of the school of engineering, Columbia University.

In describing the aims of the organization, Dr. Hirshfeld said, "The work of the Council begins with the prospective engineering student, considers the fundamentals of his technical, social and economic training, follows him through his early post-college years, and finally examines his fitness for recognition as an engineer." At present, there are no uniform professional standards, although many states have adopted a system of licensing engineers by examination. It is for the purpose of bringing order out of the present chaotic condition that the Council proposes to serve as a central body to determine who is qualified to practice as an engineer and use the professional title.

Guy Hubbard Finds U. S. Leads in Tools

According to a preliminary report prepared by Guy Hubbard, unofficial historian of the machine tool industry, the United States is supreme in the design and development of machine tools and is likely to maintain this leadership for at least another twenty years. The study was made under the auspices of the National Machine Tool Builders' Association.

Mr. Hubbard points out that within the last six years advances in precision and capacity made by American designers and builders of machine tools, have equalled the total cumulative advances within the preceding generation and a half. Each of the principal industrial nations has drawn upon this country's improvements in machine tools as bases for its own improvements, while some independently have made startling advances. Russia in particular is straining feverishly to develop her own machine tool industry for the future and is making this a feature of her national program of economic rehabilitation. Studies that have been made within the last few months indicate that Germany and England are competing for second place in the development of a "New-Era" machine tool industry with neither showing a distinct advantage.

General Electric Honors Employees

Forty-four employees of the General Electric Co. have received awards by the Charles A. Coffin Foundation, each consisting of a certificate and a cash honorarium. August Kayser, tool engineer at the Fort Wayne Works, who has been with the company 44 years, received his third Coffin award in recognition of his skill and ingenuity in redesigning the winding arbor for motor stators. T. S. Cooper, toolmaker in the Schenectady works, who in 1927 received a Coffin award, was honored again this year for designing a vacuum feed for paper insulation on coil winding machines.

Cited in 1924, C. P. Bloomer, division superintendent at the Philadelphia works, was again honored jointly with E. V. Jones and G. M. Reed for the origination of new methods of wiring panels, accumulating stock and assembling switchgear equipment. C. H. Panthen, assistant general foreman at the Schenectady works, was also honored for the second time, this year receiving his award for his inventions in packing material.

Foundry Equipment Business Increases

According to the latest report of the Foundry Equipment Manufacturers Association, the index of gross orders for January was 86.6 as compared to the December figure of 66.9 and that for January 1934 of 37.2. Shipments were better than a year ago, with an index of 76.2 as compared to 33.4, but under the December figure of 81.1. Unfilled orders rose to 69.2 from 54.4 in the preceding month and were nearly triple those for January, 1934, at 33.8.

The three months' average of gross orders also showed considerable improvement with a January figure of 78.0 contrasted with December's 57.7 and 39.2 for the corresponding month last year. Twenty-one concerns in the industry contributed to this report.

• OBITUARIES •

Dr. Wm. H. Beardsley, an active director of the Jones & Lamson Machine Co., Springfield, Vt., died March 2. Dr. Beardsley was born in 1881, was graduated from the Yale Medical School and had considerable medical experience before going to Springfield in 1915. He became manager of the Fay automatic lathe department, and later production superintendent and a director.

Beverly S. King, 56, NRA deputy administrator since August, 1933, with general supervision of basic and supplementary codes in the plant equipment section of the equipment division, was killed by an automobile in Washington on March 4. He had charge of the codes for 65 industries embracing 17,000 plants and 450,000 employees.

Thomas R. Stewart, 71, superintendent of the Mount Clare Shops, the Baltimore & Ohio Railroad, died February 19. He had been connected with the company for 49 years, and served in the shops at Baltimore, Martinsburg, West Virginia, Connellsville, Pa., and Cumberland, Md. He was made superintendent at Baltimore in 1920.

Wm. S. Elliott, president of the Elliott Co., Pittsburgh, Pa., machinery manufacturers, died February 21 at the age of 72.

David F. Noble, for 20 years a machine tool dealer in Chicago, died February 15 at the age of 52. He was the Chicago representative of the Foote-Burt Company.

E. Guy Richards, 57, manager of the Oneida, N. Y., plant of the Dodge Pulley Works and the Dodge Mfg. Corp., for the past 17 years, died February 25 in Utica.

• EXPORT • OPPORTUNITIES

Bucket dredges, suction and standard, for placer mining. *8560. Nelson, Canada.

Engines, crude oil, marine. *8546. Zanzibar, East Africa.

Polishing and finishing machines, for furniture and automobile bodymakers; portable gasoline and compressed air tools; and painting and decorating machines. *8557. Brussels, Belgium.

Refrigeration and air conditioning equipment. *8552. Buenos Aires, Argentina.

*Interested American firms and individuals may obtain the names and addresses of the foreign firms making these inquiries upon application to the Bureau of Foreign and Domestic Commerce, U. S. Department of Commerce, Washington, or any district or cooperative office.

• PERSONALS •

A. W. LAUDER, has been made vice-president and general manager of the Aurora Metal Co., Aurora, Ill., according to an announcement by GUSTAV THURNAUER, president. Mr. Lauder was formerly president of the Trindl Corporation and prior to that was connected with the Lyon Metal Products Corp.

LEO P. NEMZEK, has been appointed general manager of the Compo Shoe Machinery Corp., Boston, Mass. He was formerly a chemist with the E. I. du Pont de Nemours & Company.

RAY P. TARBELL has been appointed manager of the welding division of the Ideal Electric & Manufacturing Co., Mansfield, Ohio.

H. J. WEBER, for 15 years in charge of the Chicago office for the E. W. Bliss Co., and later with Danly Machine Specialties, Inc., is now associated with FRANK M. MCKEY, trustee for the Grigsby-Grunow Co., which is now in the course of liquidation. Mr. Weber has charge of machinery sales.

• BUSINESS ITEMS •

At the annual stockholders' meeting of Farrel-Birmingham Co., Inc., on February 21, the following officers were reelected: FRANKLIN FARREL, JR., chairman of the board; NELSON W. PICKERING, president; CARL HITCHCOCK, vice-president; FRANKLIN R. HOADLEY, vice-president; ARMIN G. KESSLER, vice-president; FREDERICK M. DREW, JR., treasurer; and GEORGE C. BRYANT, secretary.

Corporation Reports

Company	1934 Earnings	1933 Earnings
Adams Mfg. Co., J. D.	$279,014	$73,813
Ainsworth Mfg. Corp	$564,237	$105,363
American Can Co.	$19,522,945	$15,357,048
American Safety Razor Corp.	$1,065,234	$736,218
Bellanca Aircraft Corp	d$138,709	$53,083
Blaw-Knox Co.	$35,504	$111,666
Bridgeport Machine Co.	$221,907	$50,414
Bucyrus Erie Co.	d$289,036	d$990,818
Bucyrus-Monighan Co.	$63,241	$40,425
Burroughs Adding Machine Co.	$3,253,500	$1,304,557
Case Co., J. I.	d$699,923	d$2,093,503
Chrysler Corp.	$9,534,836	$12,129,120
Crane Co.	$1,021,543	d$1,874,823
Curtis Lighting, Inc.	d$50,061	d$85,128
Cutler-Hammer, Inc.	$66,000	d$130,386
Electric Controller & Mfg. Co.	$178,786	d$79,150
Evans Products Co.	$1,323,840	$297,126
Ex-Cell-O Aircraft & Tool Corp.	$140,301	d$63,118
Federal Screw Works, Inc.	d$28,957	d$149,154
Gemmer Mfg. Co.	d$13,047	d$32,117
Geometric Stamping Co.	d$147,580	d$47,534
General Bronze Corp.	d$460,239	$39,249
Gold Seal Electrical Co.	d$95,794	$27,404
Hoe & Co., R.	*d$43,124	*d$348,764
Marion Steam Shovel Co.	d$215,287	d$570,562
McCord Radiator & Mfg. Co.	d$27,509	$24,757
Mesta Machine Co.	$1,517,250	$630,678
National Acme Co.	$140,329	d$311,056
Nelson Corp., Herman	d$64,401	d$178,436
New Haven Clock Co.	$98,560	$126,870
Ohio Forge & Machine Corp.	$1,775	.....
Royal Typewriter Co., Inc.	$942,229	$145,221
Seagrave Corp.	d$90,727	d$93,433
Segal Lock & Hardware Co.	d$9,635	d$65,126
Square D Co.	$428,769	$93,026
Underwood Elliott Fisher Co.	$2,604,879	$1,517,943
Universal Products Co.	$187,912	$57,595
Veeder-Root, Inc.	$278,315	$266,607
Walworth Co.	d$234,038	$881,629
Westinghouse Electric & Mfg. Co.	$189,562	d$8,636,841

d—Deficit. *—Eleven months ending Nov. 30.

• PATENTS •

February 26, 1935

Metal-Working Machinery

Press. Henri P. L. Laussucq, Reading, Pa., assigned to Birdsboro Steel Foundry & Machine Co. Patent 1,992,314.

Machine for Centrifugal Casting. William D. Sargent, New York, N. Y., and William A. Geisler, Newark, N. J., assigned to Durafer, Inc. Patent 1,992,241.

Machine for Making Bale Ties. Albert F. Bradley, Sterling, Ill., assigned to Northwestern Barb Wire Co. Patent 1,992,286.

Coordinated Electric Head and Column Clamp. David C. Klausmeyer, Cincinnati, Ohio, assigned to the Cincinnati Bickford Tool Co. Patent 1,992,311.

Nut Blank Machine. Eugene V. Kuebrick, North Tonawanda, N. Y., assigned to Buffalo Bolt Co. Patent 1,992,316.

Machine for Automatically Producing Clasp Fastener Strips. Friedrich Fuchs, Frankfort-on-the-Main, Germany, assigned to firm Revag A.-G., Zuzwil, Switzerland. Patent 1,992,367.

Milling Machine. Richard Stuhlmacher, Siegmar, near Chemnitz, Germany, assigned to Wanderer-Werke vorm. Winklhofer & Jaenicke Akt. Ges., Schonau, near Chemnitz, Germany. Patent 1,992,403.

Machine for Grinding Springs. Harry P. Troendly, Chicago, Ill., assigned to W. D. Gibson Co. Patent 1,992,452.

Power Shear and the Like. Frederick E. Munschauer, Buffalo, N. Y., assigned to Niagara Machine & Tool Works. Patent 1,992,539.

Welding Apparatus. Wilfred Sykes, Chicago, Ill., assigned to Direct Current Welding Co. Patent 1,992,553.

Centrifugal Casting. Frank G. Carrington, Anniston, Ala., assigned to Centrifugal Pipe Corp. Patent 1,992,739.

Furnaces

Heat-Treating Furnace. William E. Blythe, Birmingham, Mich., assigned to Driver-Harris Co. Patent 1,992,466.

Heat-Treating Furnace. William E. Blythe, Birmingham, Mich., assigned to Driver-Harris Co. Patent 1,992,467.

Tools and Attachments

Sheet Metal and pipe Cutter. Frank Mart Hooley, Yuba City, Calif. Patent 1,992,211.

Wire Coating Apparatus. John P. Gerber, Muskegon, Mich., assigned to the Electric Auto-Lite Co. Patent 1,992,206.

Casting Apparatus. Lorenz Mecki, Lincoln Park, Mich. Patent 1,992,230.

Tool for Drilling Polygonal Holes. Rudolf Bartholomaus, Berlin, Germany. Patent 1,992,346.

Spray Gun. Abraham M. Herbsman, Huntington Park, and Rodney B. Campbell Walnut Park, Calif., assigned to said Herbsman. Patent 1,992,426.

Diestock. Franklin Judge, Greenfield, Mass., assigned to Greenfield Tap & Die Corp. Patent 1,992,530.

Turning, Forming, and Threading Attachment for Drill Presses. Clarence Turnepseed, Springfield, Ohio, assigned to Frank G. Campbell. Patent 1,992,558.

Dressing Tool. Carl E. Pioch, Detroit, Mich., assigned to Wheel Trueing Tool Co. Patent 1,992,768.

Welding Electrode. James M. Weed, Ballston Lake, N. Y., assigned to General Electric Co. Patent 1,992,792.

Processes

Process of Making Bullets. Alfons G. Schuricht, Alton, Ill., assigned to Western Cartridge Co. Patent 1,992,244.

Method of Forming Hollow Forged Valves. William Scrimgeour, Washington, D. C. Patent 1,992,245.

• MEETINGS •

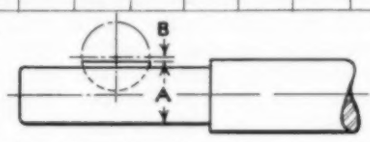
AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Machine Shop Practice Meeting and Exhibit, afternoon and evening, March 28. Engineering Bldg., 205 W. Wacker Drive, Chicago. C. B. COLE, chairman, 4625 Fulton St.

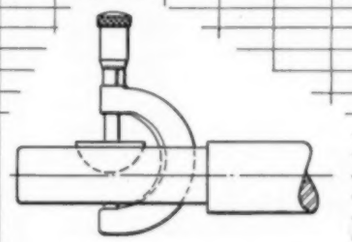
AMERICAN MANAGEMENT ASSOCIATION. Joint conference of the Job Order and Mass Production Divisions, April 18-19. Hotel Statler, Cleveland. American Management Association, 20 Vesey St., New York, N. Y.

SELECTION AND INSPECTION OF WOODRUFF KEYS

KEY CIRCLES AND CUTTER DIAMS.	B	KEY WIDTHS 1/16	3/32	1/8	5/32	3/16	1/4	5/16	3/8	7/16	1/2	5/8	3/4	7/8	1	1 1/4	1 1/2	1 3/4	2
1/2	3/64	204	304	404															
5/8	1/16		305	405	505														
3/4	1/16			406	506	606													
7/8	1/16				507	607	807												
1	1/16					608	808	1008											
1 1/8	5/64					609	809	1009											
1 1/4	5/64	Key Numbers					810	1010	1210										
1 3/8	3/32						811	1011	1211										
1 1/2	7/64						812	1012	1212										
	1/2	0.530	0.544	0.544															
9/16			0.605	0.617															
5/8			0.668	0.681	0.693														
11/16			0.731	0.744	0.756														
3/4			0.793	0.807	0.819	0.831													
13/16				0.870	0.883	0.895													
7/8				0.933	0.931	0.958													
15/16				0.995	1.009	1.021													
1				1.058	1.071	1.084	1.110												
1 1/16					1.134	1.147	1.173												
1 1/8					1.197	1.210	1.237												
1 3/16					1.260	1.273	1.299												
1 1/4					1.323	1.336	1.363	1.387											
1 5/16						1.339	1.425	1.450											
1 3/8						1.462	1.488	1.513											
1 7/16						1.525	1.551	1.576											
1 1/2						1.587	1.614	1.640	1.663										
1 9/16							1.677	1.704	1.727										
1 5/8							1.740	1.766	1.790										
1 11/16							1.802	1.830	1.854										
1 3/4							1.866	1.892	1.917	1.941									
1 13/16							1.928	1.955	1.981	2.005									
1 7/8							1.991	2.018	2.043	2.068									
1 15/16							2.053	2.081	2.107	2.131									
2							2.117	2.144	2.170	2.194	2.219								
2 1/16							2.180	2.207	2.223	2.258	2.282								
2 1/8							2.243	2.270	2.296	2.321	2.346								
2 3/16							2.305	2.333	2.359	2.384	2.408								
2 1/4							2.368	2.396	2.422	2.447	2.472								
2 5/16							2.431	2.458	2.485	2.511	2.535								
2 3/8							2.494	2.521	2.547	2.573	2.599								
2 7/16							2.556	2.583	2.611	2.637	2.661								
2 1/2							2.619	2.647	2.678	2.700	2.725	2.772							
2 5/8							2.744	2.772	2.800	2.825	2.851	2.899							
2 3/4							2.870	2.898	2.924	2.951	2.977	3.026							
2 7/8							2.995	3.023	3.050	3.077	3.103	3.153							
3							3.120	3.148	3.176	3.202	3.229	3.279	3.327						
3 1/8							3.245	3.274	3.301	3.328	3.355	3.405	3.454						
3 1/4							3.371	3.399	3.426	3.454	3.481	3.532	3.581						
3 3/8							3.496	3.524	3.552	3.580	3.607	3.660	3.707						
3 1/2							3.621	3.649	3.678	3.705	3.732	3.784	3.834	3.881					
3 5/8							3.746	3.775	3.802	3.830	3.858	3.910	3.960	4.010					
3 3/4							3.871	3.900	3.928	3.956	3.984	4.036	4.087	4.135					
3 7/8							3.996	4.025	4.053	4.081	4.109	4.162	4.213	4.262					
4							4.121	4.150	4.178	4.206	4.234	4.287	4.339	4.389	4.436				
4 1/4								4.400	4.429	4.457	4.585	4.539	4.591	4.641	4.690				
4 1/2								4.650	4.679	4.708	4.736	4.790	4.843	4.894	4.943				
4 3/4								4.900	4.930	4.958	4.986	5.041	5.095	5.146	5.196				
5								5.151	5.180	5.209	5.237	5.292	5.346	5.398	5.449	5.545			
5 1/4									5.430	5.459	5.486	5.543	5.598	5.650	5.702	5.799			
5 1/2									5.681	5.710	5.738	5.794	5.849	5.902	5.954	6.053			
5 3/4									5.931	5.960	5.989	6.045	6.104	6.154	6.206	6.306			
6									6.181	6.210	6.239	6.296	6.351	6.405	6.459	6.559	6.654		
6 1/4										6.461	6.490	6.546	6.602	6.656	6.789	6.811	6.908		
6 1/2										6.711	6.741	6.797	6.853	6.907	6.961	7.064	7.162		
6 3/4										6.961	6.990	7.048	7.104	7.159	7.212	7.316	7.415		
7										7.211	7.241	7.298	7.355	7.410	7.464	7.569	7.668	7.764	
7 1/4											7.491	7.549	7.605	7.661	7.715	7.820	7.921	8.017	
7 1/2											7.741	7.799	7.856	7.911	7.966	8.074	8.174	8.271	
7 3/4											7.991	8.049	8.106	8.162	8.217	8.324	8.426	8.525	
8											8.242	8.300	8.357	8.413	8.469	8.575	8.679	8.778	8.873

Shaft Diameters





Dimension A is important to the shop when milling shafting for Woodruff and square keys. Optimum key width is equal to one-quarter the shaft diameter. Shafting and key sizes are American standards, except that between 3/8 and 3/4 in. widths the Woodruff keys are available but not standard.

To use chart: Locate the shaft diameter in the left-hand column. Read across to column for the desired key width. At this point will be found dimension A, which should be added to the shop drawing

Contributed by Joseph H. Roberts & Associates, Inc.

A Printing Press Frame Miller

M. M. McCALL

IN MANY cases, where the increased cutter cost is justified by the results obtained, we have seen the planer replaced by the milling machine. The slotter has not escaped this competition, but because of its ability to machine surfaces in small pockets and openings, it still enjoys a wide usage.

Slotters have always been handy machines in printing press shops. Printing press frames and other members have many openings with surfaces to be machined at different angles. For many years, the Goss Printing Press Company has used a special type of frame slotter for these operations. The machine has a planer type table, adjustable on a bed between housings, with the slotting ram mounted in a head adjustable along the cross rail.

In recent years the Goss Company has been carrying out an extensive shop modernization program. When a study was made of the frame slotter, the conclusion was reached that a large saving could be accomplished if a suitable milling machine could be designed for the same operations. The matter was turned over to the machine tool builders and resulted in the purchase of the special milling machine shown in Fig. 1.

This machine was designed and built by the Newton division of the Consolidated Machine Tool Corporation. The different cutters are mounted on a horizontal spindle in the lower end of a rectangular bar which extends from a head on the cross rail. The drive shaft extends through the center of the rectangular bar. The drive originates from a constant speed motor which is direct gear connected through a speed change box, bevel gears and worm and worm wheel; the worm wheel driving the vertical shaft through the bar. The design of the cutter bar is such that it will enter the small openings in the press frames and at the same time provide the necessary stiffness for the milling operations.

The bar slides through a rectangular opening in the center of a cylindrical drum which is mounted in bearings in the head. Taper gibs on two sides provide adjustment for taking up wear. The drum may be rotated through a full 360 deg. to set the milling cutter to any desired angle. A vertical feed or rapid traverse of 20 in. is provided for the cutter bar. This feed or traverse may be obtained at any angular setting of the cutter.

The head is provided with feed or rapid traverse in both directions along the crossrail. With the cutter properly set, face milling operations may be performed on the end surfaces or other traverse vertical surfaces on the work. The crossrail carrying the head is provided with vertical adjustment on the housings and may be fed in either direction if desired.

The work table is provided with feed and rapid traverse in both directions on the bed by means of a bronze spiral pinion meshing with a steel angular rack on the under side of the table. With the cutter properly set, face milling operations may be performed on the sides or other longitudinal vertical surfaces on the work.

Control of all head motions is provided by levers on the head. Levers are provided at the operator's position for controlling the rail elevation, the power feed or rapid traverse to the table and the power feed or rapid

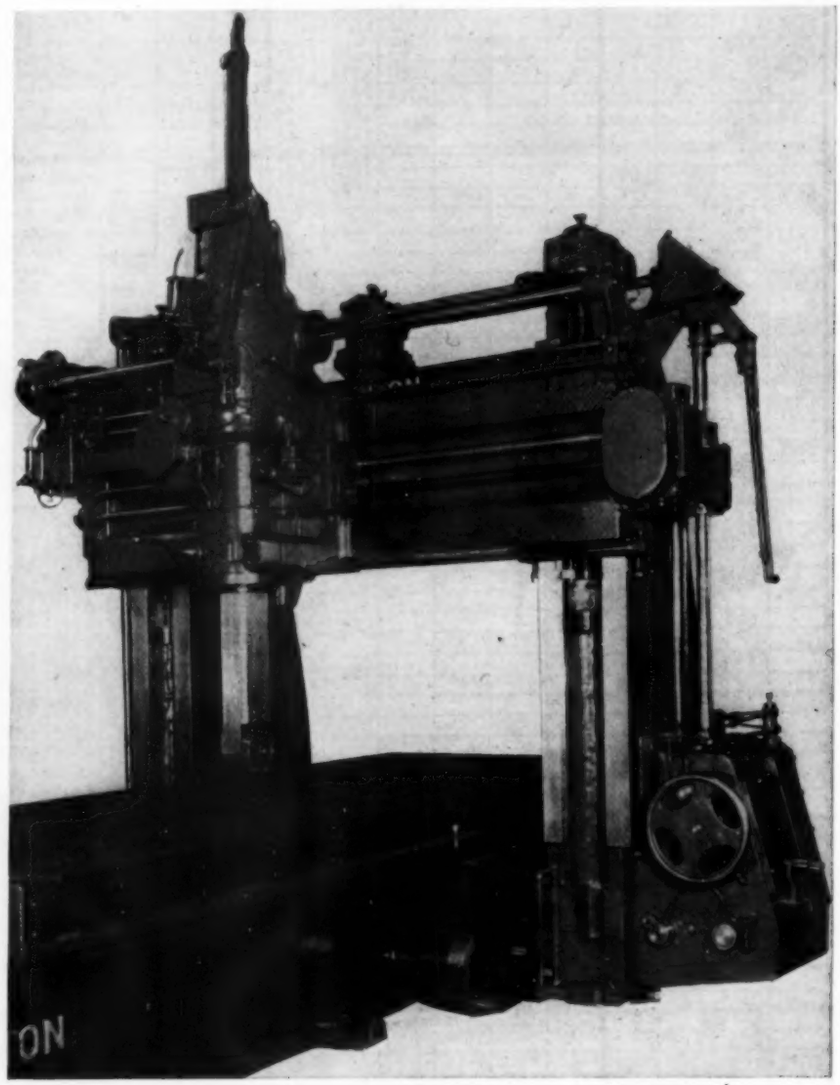


Fig. 1—Used for machining printing press frames, this special miller is capable of reaching into pockets

traverse to the rail head. A handwheel is provided at the operator's position for fine hand adjustment of the table, rail or rail head. Dual control levers are provided on each side for controlling the movement of the table.

It is evident from the above description that the cutter will easily reach the various seats, pads and bearing cap surfaces in printing press frames. In addition, the outside vertical surfaces may be readily machined.

Fig. 2 shows the rough outline of three different types of frames. The surfaces to be machined are indicated; and the various locations of the cutter bar, with cutters of suitable size, are shown with respect to these surfaces. In some cases, as at *A*, it is possible to stack similar frames so that operations may be performed on both frames with the same setting of the cutter.

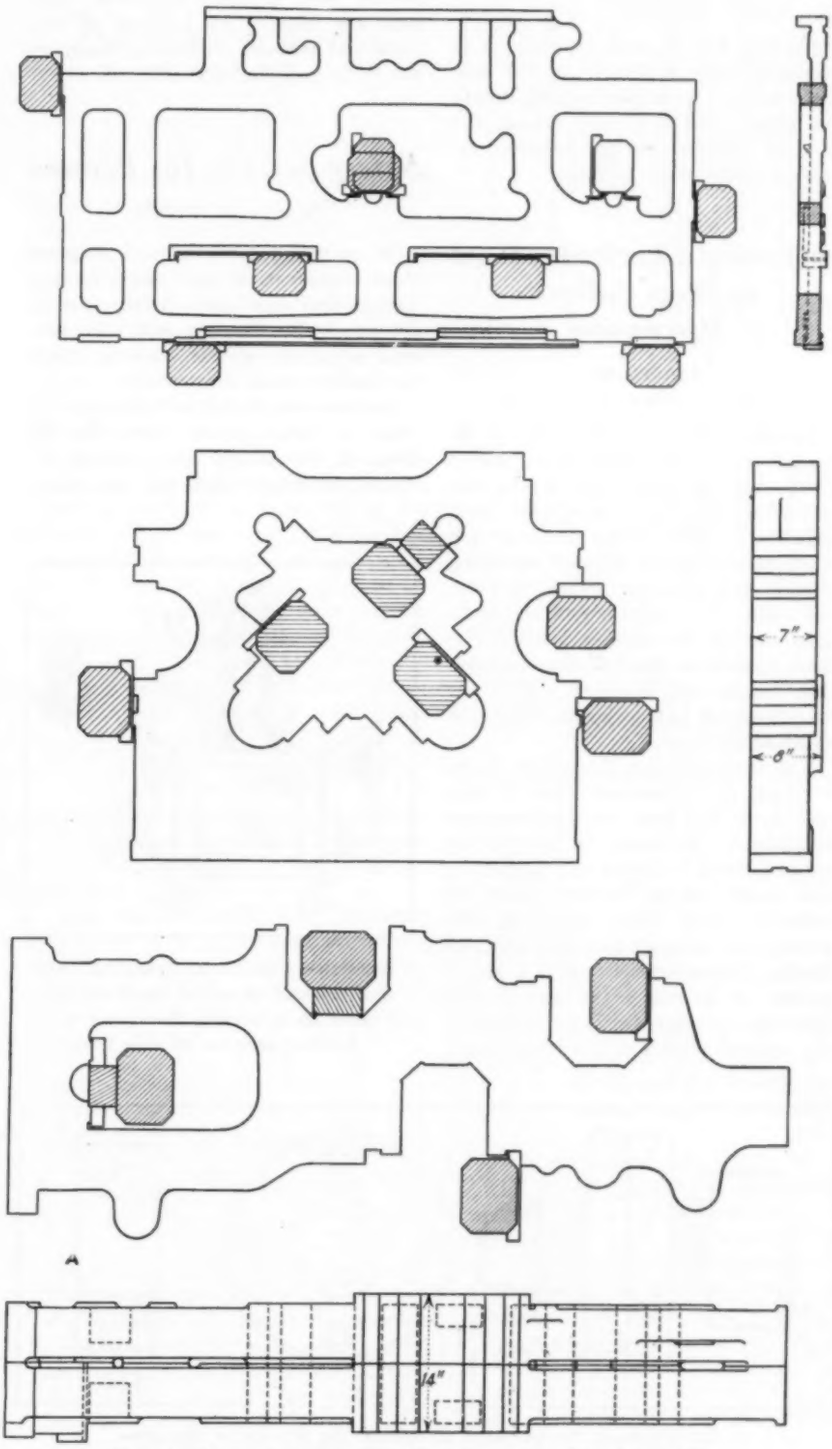


Fig. 2—These three types of frames are machined by milling; the cutter head is shown in various operating positions

This special milling machine was purchased primarily for machining operations on printing press frames similar to those illustrated in the accompanying drawings. However, instead of being considered as a special machine for one class of work, it has earned for itself the reputation of being a universal machine that can be used for almost any kind of slotter work. The machine is now being used for practically all of the Goss Company's slotter work and for a great many other jobs which they did not have in mind at the time the machine was purchased.

On almost all of the operations for which it has been used, it has shown a saving of from 25 to 30 per cent over the old methods.

Why a Time Study? Discussion

C. A. COPPACK
Leicester, England

In the article by P. Kornau under the title given above (*AM*—Vol. 78, page 511), I think the author reflects the attitude of many operators. His latter remarks as to one time study for one operator not applying to another operator are singularly unfortunate.

The very essence of payment by results is to get work done in a minimum time. For this purpose a standard time must be set. The slow man will have something to aim at and the quick man will come up to it. Mr. Kornau inquires why we time individual operations and not the job as a whole. Experience has shown that it often happens that one particular operation can be eliminated, or that it takes too long and requires modification. The individual time will show this. Also that at some future time the operator can check if he is living up to the time and if not, where he is losing.

Your correspondent looks upon time study as simply setting a rate by observation and accepting the operator's time as the correct one. That is not time study. It is essential that the various operations be studied separately, those showing the greatest variation over a batch being given the first attention.

IDEAS

FROM • PRACTICAL • MEN

Set-Up Time for Internal Grinding

H. J. CHAMBERLAND

Whatever means are devised to increase the percentage of actual production in the toolroom is just another step toward lower manufacturing costs. The set-up illustrated in Fig. 1 shows at least one way of cutting down nonproductive time.

Any toolroom hand knows what it means to change the average universal cylindrical grinder from external to internal requirements, or vice versa. It takes the grinder operator no less than fifteen minutes to make the change.

By means of the bracket shown in Fig. 2, a toolpost grinder can be mounted on the platen of the grinding machine and can remain almost permanently attached to it. To change to the set-up for internal grinding, it is necessary only to throw off the belt that drives the regular wheel, rotate the platen 180 deg. and mount the toolpost grinder on the bracket, requiring about three minutes.

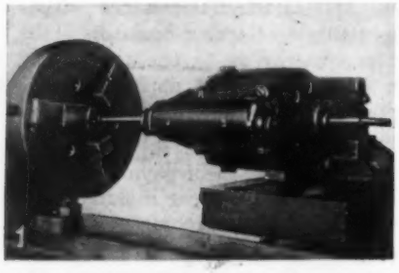


Fig. 1—A toolpost grinder mounted on the platen of the universal cylindrical grinder permits changing from external to internal grinding in a few minutes

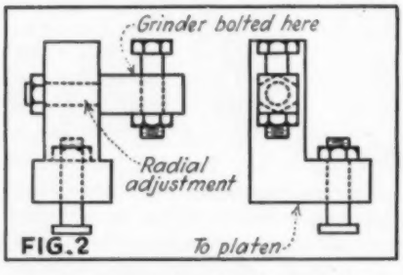


Fig. 2—Simple bracket for attaching the toolpost grinder to the platen of the universal cylindrical grinder. The bracket can almost remain as a permanent fixture

Adjusting Checknuts Used as Stop Collars Discussion

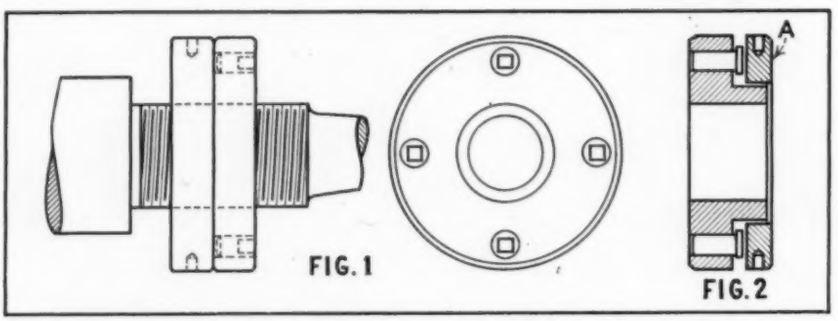
J. B. BOOTH

Bradford, Yorkshire, England

Referring to the article by J. E. Fenno under the title given above (*AM*—Vol. 78, page 716), in the second case the objection is that such keyways as Mr. Fenno proposes are ready targets for all sorts of untoward burring and abrasion, which, in turn, will cause the tightening of the locknuts and of the washer itself. The third method is open to the objection that the pin will necessarily limit the movement of the locknuts along the shank of the tool.

The accompanying illustration shows a couple of suggestions which I consider to be free from the disadvantages mentioned. Referring to Fig. 1, the upper locknut is drilled and tapped for four small locking screws. After the locknuts have been adjusted, the screws are tightened and lock the nuts firmly. Releasing the nuts is a simple matter of loosening the screws, and this can be done without disturbing the original setting of the lower nut.

Referring to Fig. 2, the upper locknut is shouldered and the smaller diameter is threaded and is fitted with the collar nut *A*. A number of holes are drilled in the shoulder into which headed push pins are fitted. After the locknuts have been adjusted, the collar nut is tightened, forcing the pins into contact with the lower locknut and locking both locknuts together. The nuts are released by backing off the collar nut without disturbing the original setting of the lower locknut.



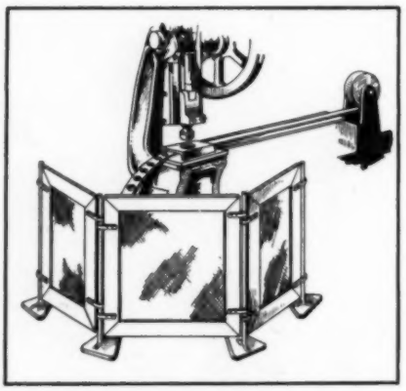
By releasing the pressure of either the screws or the pins on the lower locknut, the upper nut can be turned without disturbing the original setting of the lower one

Safety Screens for Presses

CHARLES H. WILLEY

When coiled stock is used in press work, there is always more or less danger that someone will trip over or get caught in the free end. To prevent accidents of this kind we made the safety screen illustrated.

Each section is a hardwood panel to which is tacked screen wire. On the sides of the panels are attached U-shaped brackets that act as hinges



Accidents caused by tripping over the free end of coiled stock are prevented by guarding the press with folding screens of this type

when rods are passed through them. The uprights or posts are made by riveting ½-in. round iron rods to triangular floor plates.

The screens can be made any desired length by simply adding panels and posts.

•

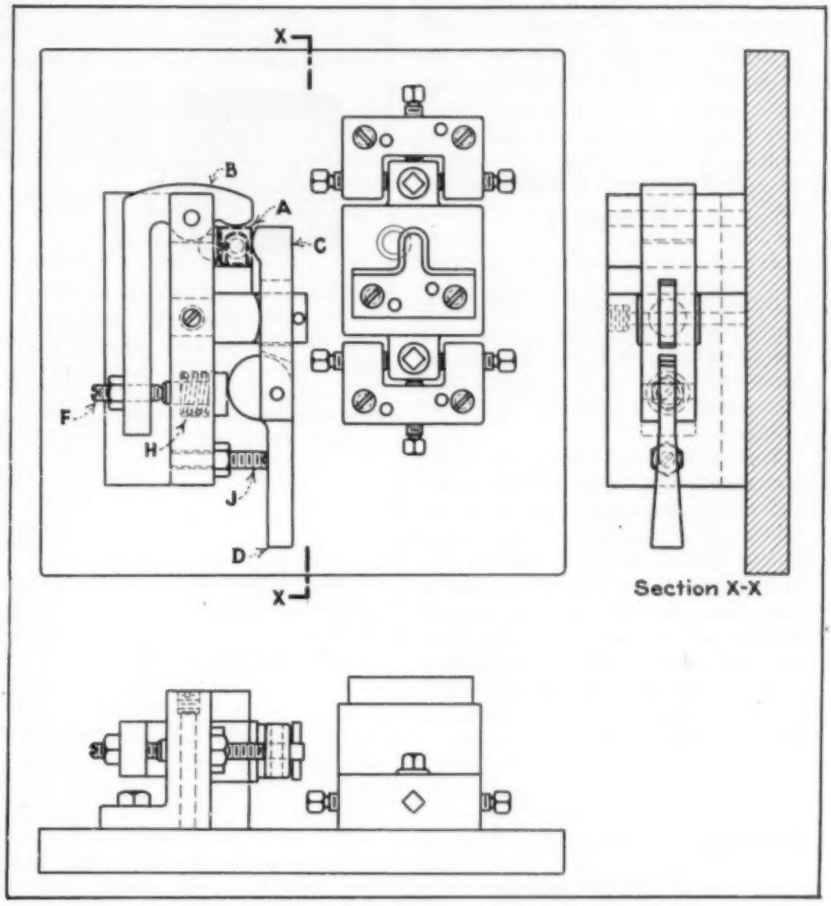
Quick-Acting Fixture for Profiling

FRED. G. KENYON
Tool Designer, Springfield Arsenal

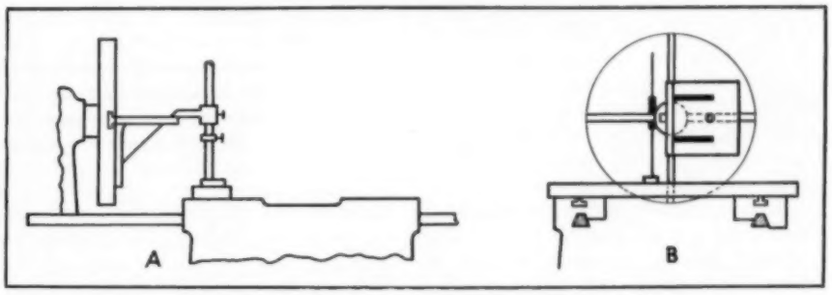
In making small interchangeable parts in large quantities, especially for small arms manufacture, it is necessary to have quick-clamping fixtures. Since clamping by screws is too slow, the fixtures are generally provided with cam-operated clamps. Such fixtures must also be self-contained, as loose pieces or wrenches lying around are likely to fall on the floor or get lost in the toolcrib.

In the fixture illustrated, the work is a square piece having a tongue profiled on one end, as indicated by the heavy dotted lines at *A*. The work is clamped in two directions by clamps *B* and *C*, both of which are operated by the cam lever *D*, which acts directly on clamp *C* and indirectly on clamp *B*. Adjustment for clamp *B* is provided by a headless setscrew and a checknut at *F*. The inner end of the screw bears against the spring-actuated plunger *H*, which helps to equalize the pressure of both clamps on the work. At *J* is a headless setscrew locked by a locknut that can be adjusted to prevent the cam lever from being pushed down too far.

The former, former block and the yokes for their adjustment are shown on the same block with the plan view of the fixture, the arrangement being standard in nearly all small-arms factories.



The cam lever acts directly on clamp *C* and indirectly on clamp *B*, clamping the work in two directions. Clamping pressure is equalized by a spring-actuated plunger



By setting the toolbit on an angle plate mounted as described, it can be ground with a toolpost grinder held in the compound rest

Grinding a Section of a Cone—Discussion

O. D. BRADSHAW

Referring to the article under the title given above (*AM*—Vol. 78, page 777), I think J. E. Moore has gone to a lot of unnecessary work. As I understand it, he is an instructor in a technical school, therefore he may have time in which to do special jobs, although from my experience as an instructor in a vocational school I have no idle moments.

The fixture described by Mr. Moore, modified to a certain extent as to clamping the work, etc., would be all right if a quantity of the toolbits were required, but as I gather from the article but one toolbit was wanted.

Therefore, why not ascertain the dimensions of a cone of the correct size to produce the required contour, then attach an angle plate to the faceplate of the lathe and by means of a vernier height gage resting on a parallel placed across the wings of the carriage, set it to the required distance above the center as determined by the desired cone radius and the size of the toolbit, as at *A* in the illustration.

Place the toolbit to be ground on the angle plate and hold it lightly by a toe clamp. Then by rotating the faceplate 90 deg. so that the face of the angle plate is vertical, as at *B*, center the toolbit with height gage, making sure that the toolbit is at a right angle to the faceplate, and clamp it firmly. Set the compound rest to

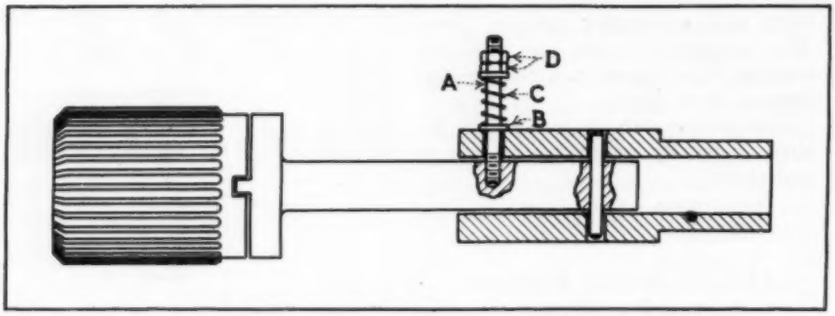
the required angle of taper, put in the toolpost grinder and grind the toolbit to shape. Accurate results can be had by this method in a short time.

Balancing Floating Reamers

CHARLES KUGLER

In reaming 5-in. holes in work in the turret lathe, using a floating reamer of the usual type, we found that the unbalanced weight of the reamer made the holes both oversize and bell mouthed.

To overcome the trouble, we drilled a clearance hole in the holder, drilled and tapped the reamer shank for the stud *A*, on which we placed the washer *B*, the helical spring *C* and the adjusting nuts *D*, as indicated in the illustration. By adjusting the nuts to increase or decrease the spring pressure, we were enabled to counterbalance the weight of the reamer and to produce straight holes accurate in diameter and free from bell mouth.



Straight holes accurate in diameter and free from bell mouth were produced by counterbalancing the floating reamer by the device illustrated

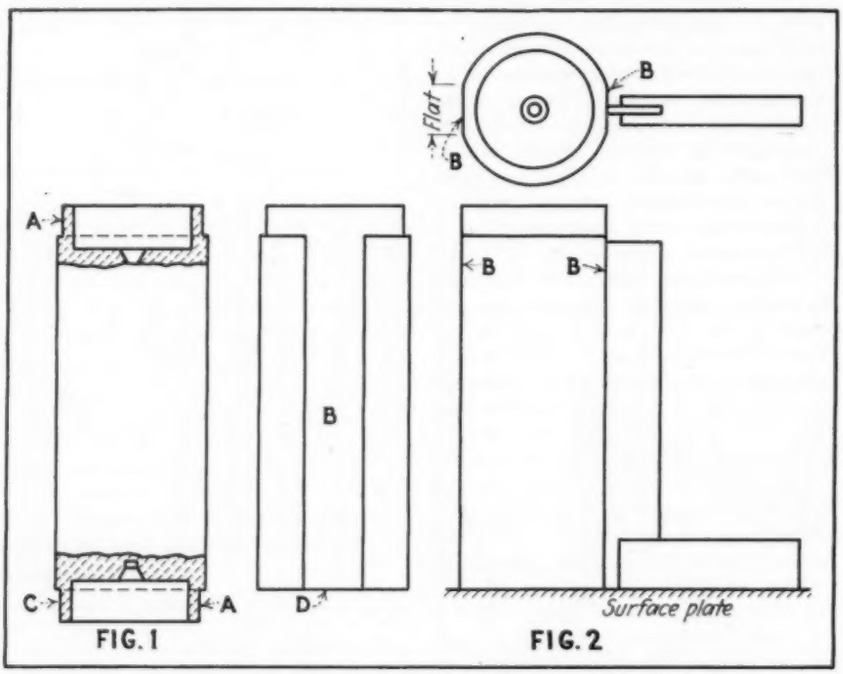
Testing Squares for Truth Discussion

J. T. TOWLSON
London, England

Referring to the article by John E. Hyler under the title given above (*AM*—Vol. 78, page 714), the method described is all right providing the blade of the square stands laterally at 90 deg. to the surface plate. If it does not, then the accuracy of both the surface plate and the test cylinder becomes considerably discounted.

In my practice of testing squares I have used a truly ground and parallel cylinder having the ends reduced in diameter, as at *A*, Fig. 1, the grinding being done on dead centers. Afterward, flats are ground on diametrically opposite sides of the cylinder flush with the reduced diameters at the ends, as at *B* Fig. 2. The reduced diameters at the ends serve as guides in grinding the flats parallel with the body of the cylinder, and this parallelism is insured when the width of the flats is the same at both ends.

The cylinder is again placed on dead centers, and the addendum *C* is ground away, so that when the cylinder is stood on end on the surface plate, the flats at that end will reach its surface. Thus the full length of the square blade can be tested. With the cylinder stood on end on the surface plate, all is ready for testing the square, as shown in Fig. 2. As the edge of the blade contacts with one of the flat surfaces on the cylinder, any deviation from lateral squareness of the blade with the surface plate is of no moment.



Flats on diametrically opposite sides of the cylinder provide means of testing a square when the sides of the blade do not stand perpendicular to the surface plate

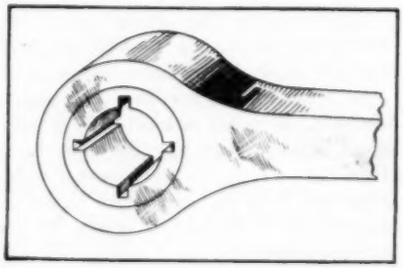
Slots Did It—Why?

FRANK C. HUDSON

There is probably a reason for all things, but it is frequently hidden in some out-of-the-way corner. A case of this kind is shown in the accompanying sketch. This is a bushing pressed into the end of a connecting rod. It is not a floating bushing.

The joker is that when made without the slots, it seemed next to impossible to keep the bushings tight in the rod. Varying the press fit allowance and consequently the pressure, seemed to make little difference with the plain bushing. But after someone tried cutting slots lengthwise as shown, the trouble disappeared.

Now everyone wants to know why?



NEW BOOKS

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STANDARD GEAR BOOK. *By Reginald Trautschold. 314 pages. 6x9 inches. Published by McGraw-Hill Book Co., Inc., New York. Price $3.00.*

This volume is the outgrowth of the "American Machinist Gear Book," by Charles H. Logue, first published twenty-five years ago. With this as a base Mr. Trautschold first made several revisions of the book and now presents what is practically a new book which takes into account the many changes that have taken place since the last edition of the old book. This has been done instead of another revision in the belief that the tempo of the times demands a different treatment. Much of the historical background has been omitted to make room for material believed to be of more vital use to makers of gears, many of whom cooperated in the production of the present volume.

The new volume contains sixteen chapters and an appendix, the working formulas and tables used in gear design being segregated into this section. The main part of the book discusses tooth forms; speed and power; gear proportions and design; spur gear calculation; straight-tooth bevel gears; helical and herringbone spur gears; spiral gearing; worm gearing; spiral bevel, skew bevel and hypoid gears; internal gearing; epicyclic gear trains; gear units; methods of gear production; materials and heat-treatment; measurement of gear teeth; and rolled gearing. While it is obviously impossible to give a résumé of all that the volume contains, the subjects given show that the various phases of gearing have been given careful consideration.

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MARKETING INDUSTRIAL EQUIPMENT. *By Bernard Lester. 307 pages, 6x9 inches, bound in cloth boards. Illustrated. Published by McGraw-Hill Book Company, Inc., New York and London. Price* $3.50.

Based on a course of lectures given at the graduate school of the University of Pittsburgh, this book presents clearly and concisely the elements of the problem of marketing capital goods as distinct from the quite different problem of distributing consumer goods. The author's long experience in the industrial sales organization of the Westinghouse Electric & Manufacturing Co. gives him the background for an authoritative presentation of his subject. He has not hesitated to draw on good sources of facts such as the Marketing Counsellors Staff of the McGraw-Hill Publishing Co. and *American Machinist*. From the former he has taken the industry key sheet for breaking down the industrial market, and from the latter the results of the 1925 and 1930 surveys of obsolete equipment in the metal-working industry. Mr. Lester's book is so arranged that it can be used as a textbook, but it is primarily a reference book, in our opinion, and as such should be useful to anyone who sells to the industrial or capital goods market.

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THE INTERNAL COMBUSTION ENGINE—VOL. II. THE AERO-ENGINE. *By D. R. Pye. 398 pages, 6x9 in. Published by the Oxford University Press, 114 Fifth Ave., New York. Price $7.00.*

This is the second volume of a series under the editorship of E. B. Moullin, D. R. Pye and R. V. Southwell, and also has a chapter on the "Aeroplane and its Power Plant," by W. S. Farren. Some idea of the comprehensive way in which the subject has been handled may be obtained from the subjects of the chapters which include studies on piston and valve temperature, lubrication, air cooling, liquid cooling, dual air mixtures and carburetors, superchargers, two-stroke cycles, altitude and power output, fuel economy and other phases of the internal combustion engine problem. These chapters contain 57 tables and 145 diagrams to illustrate and to amplify the text. Needless to say no adequate conception of the value of the book can be given in any review. The matter has received painstaking care and every engineer who wishes to keep up-to-date on internal combustion engines will find the volume of more than usual interest.

Beryllium Copper

New materials have a funny way of getting themselves into circulation, so to speak. One of the new alloys, beryllium copper, is a good example. Comparatively high in price, approximately a dollar a pound, it seemed to be just another achievement of the metallurgist. But it is already finding a market in such a meek and lowly quarter as Stillson wrenches for use on oil tankers.

The wrench parts are forged, the teeth milled and the thread cut in the usual way. It does the work of the steel wrench, and it eliminates all danger of sparks from contact with pipe or ship plates when it slips off or drops. And a single spark on an oil tanker is likely to cost far more than all the wrenches on a fleet of tankers. Beryllium copper is also finding a field in the making of springs and diaphragms for sensitive measurements. So the metallurgist scores another point and we have another metal to add to our growing list.

An English Factory Training School

A school for juvenile employees, claimed to be the first of its kind in England, is a special feature of a factory which is at present being built at Marston Green, Birmingham, for Richards & Son, Ltd. It is an attempt to develop any natural aptitude in the boys and girls entering the employment of the firm, and will, at the same time insure that they will know their work before they enter the actual factory. Every boy and girl coming to the firm straight from school will have to undergo a two weeks course at the school but during this period full wages will be paid. This experiment is being made, according to O. L. Richards, not only for the benefit of the youngsters entering their employment but also because they believe that it will be of value to the firm.

A boy or a girl from school applying for a job will be given a chance of doing whatever class of work they think they could do best. The boys will have the choice of woodworking, painting, wheelmaking, riveting, erecting and assembling, while girls will have the choice of sewing, upholstering and hood making. If they are obviously unsuited for the work they selected, their training will be changed until a job is found for which they have some natural aptitude. In this way it is hoped to eliminate the difficulty of having obvious misfits in the works and to reduce the creation of "blind-alley" occupations which are so often due to lack of interest in the work.

The factory has a floor space of nearly 50,000 sq. ft. and will employ 500 work people. When in full production it will be capable of an output of 6,000 baby carriages a week in addition to invalid chairs, and other equipment of like nature.

SHOP EQUIPMENT NEWS

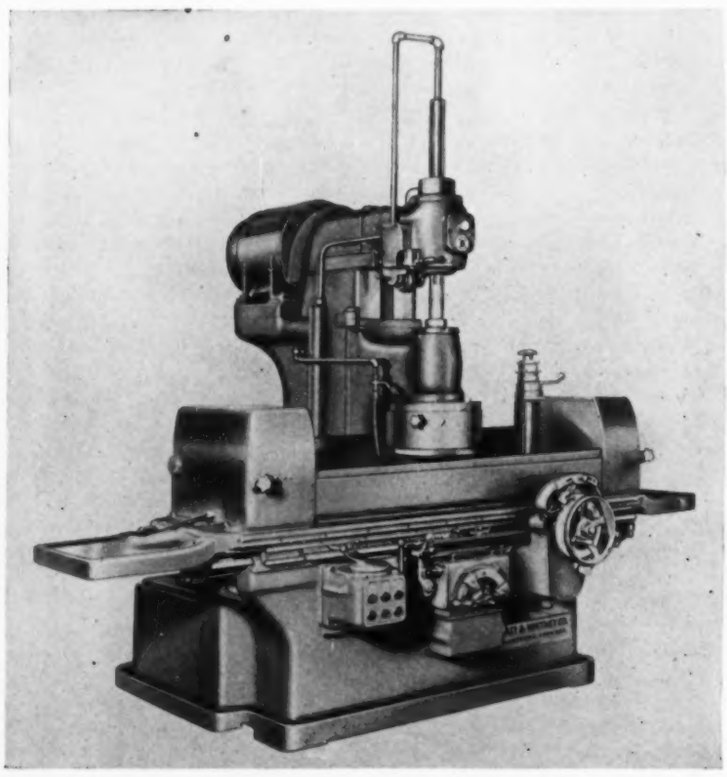
Pratt & Whitney 14-In. Hydraulic Vertical Surface Grinder

The Pratt & Whitney Co., Hartford, Conn., has placed on the market a 14-in. vertical surface grinder, with hydraulic table drive, and table speeds from 0 to 100 ft. per min. Drive to the spindle is a direct geared connection. Power is transmitted to the wheel through a pair of hardened nickel-steel, spiral-bevel gears. These gears run in oil, spindle speed is 1,265 r.p.m. Special gear ratios can be supplied if a different spindle speed is required. The entire spindle and drive mechanism is ball bearing mounted. Spindle and wheel flange are one-piece, and the upper end is splined where it slides through the spiral bevel gear. The lower spindle bearing absorbs the thrust of the grinding cut. End play in the spindle is prevented by a series of compression springs which support the upper bearings. These springs are of sufficient capacity to carry the dead weight of the spindle and wheel parts, and keep the spindle in automatic adjustment, preventing wheel sag.

The wheel used is 14 in. in diameter, 5 in. high and 1½ in. thick. It is held in a cast-iron wheel mount which bolts to the spindle flange. A steel guard surrounds the wheel to prevent damage in case of accident. Wheel truing is accomplished by a built-in device on the end of the table. The wheel down-feed mechanism is of the ratchet wheel and pawl type, and produces power feeds ranging from 0.00025 to 0.005 in. at each end of the table stroke. In addition, either a slow or a fast handwheel feed is engaged by pulling the handwheel in or out. The wheelhead is mounted on broad vertical ways, with a narrow guide for accurate alignment.

The hydraulic mechanism is driven by a separate 5-hp. motor. Oil is carried in a tank in the base of the column. It is drawn from this tank through a Cuno filter. Automatic table reversing takes place at any desired point, actuated by dogs which are adjustable along the longitudinal rack on the front of the bed. The table is fully inclosed by sheet-metal guards which can be lowered or raised to confine the spray of coolant.

Coolant is supplied to both the inside and outside of the wheel. A separate ½-hp. motor drives a built-in coolant pump. All controls are grouped on the front of the machine. Push-button control is provided for all three motors, and on top of the same box is a lever for magnetizing, or demagnetizing the magnetic chuck. The machine weighs 12,000 lb., including motor. Table working surface is 12x36 in. with a maximum longitudinal travel of 45 in. A magnetic chuck is used with a working surface 11 in. by 34 in. The machine occupies a floor space 14 ft. 5 in. long, 7 ft. 4 in. wide, and is 9 ft. 7 in. high.



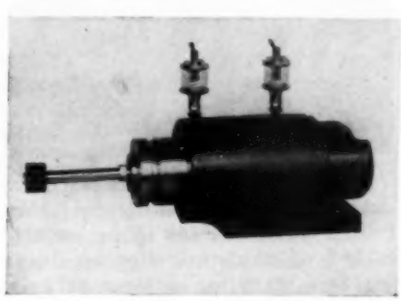
"Abrasoweld" Arc Welding Electrode

A hard surfacing electrode which is designed for building up carbon steel, low alloy or high manganese steel surfaces to resist abrasion is announced by the Lincoln Electric Co., Cleveland, Ohio. The electrode, known as "Abrasoweld," provides a deposit of abrasion-resisting alloy of the self-hardening type which surface hardens very rapidly under conditions of impact and abrasion. The deposit develops its maximum hardness only at the surface where it is cold worked. This leaves a strong, tough core for resisting shock. Weld metal produced by Abrasoweld must be ground to shape as it cannot be filed or machined. The deposit can be forged hot without materially alter-

ing its physical properties. Moderate peening will increase hardness as deposited from 20-30 Rockwell C to approximately 50 Rockwell C. Abrasoweld electrode is made in 5/32 in. size, 14 in. in length. It is used with reversed polarity with a current range of 125-200 amp. and 24-27 arc volts.

Brown & Sharpe Internal Grinding Wheelhead

The internal grinding fixture or wheelhead made by the Brown & Sharpe Mfg. Co., Providence, R. I., is designed for production grinding of holes of various diameters and depths on the No. 2, 3 and 4 universal grinders. The body contains the spindle which runs at 12,000 r.p.m. on ball bearings under constant, predetermined load. This automatically compensates for any expansion or contraction from heating. The wheel arbor is seated by a taper and held by its threaded end in the spindle. Wheel arbors are available up to 1 in. diameter and 5 in. length. An endless canvas belt drives the spindle. Net weight is 90 lb.



Nicholson Mill Tooth Files

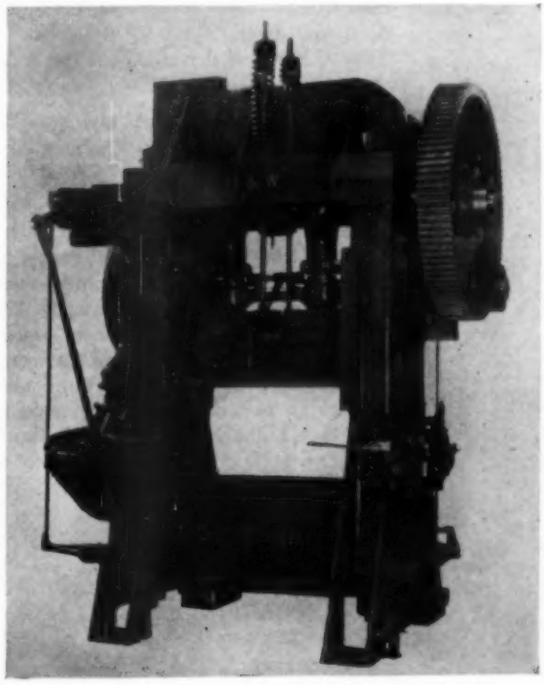
These files, known as the "Superior" brand, manufactured by the Nicholson File Co., Providence, R. I., have curved teeth so that they shear off metal rather than tear it off. These files are made in rigid and flexible types. Flexible files are designed for use with special handles on either concave or convex surfaces and are especially useful to automobile body workers and others who do filing on sheet metal, where curved surfaces must be finished. The files are made in fifteen designs. The type shown is the flat standard cut file, and is suitable for non-ferrous metals and cast iron.

Henry & Wright Automatic-Feed, Straight-Sided Presses

In addition to its line of welded steel presses, the Henry & Wright Manufacturing Co., Hartford, Conn., has added single-geared, straight-sided, welded-steel presses, arranged with an automatic double-row feed and scrap cutters. The presses are of the shrunk-in, tie-rod type. The large gears are also welded steel units. The jaw clutch located in the large gears has three simultaneous driving points, each locked in place after engagement by receding plugs. Striking faces are hardened steel inserts ground all over and readily removable. A spring counterbalanced slide, a releasing brake, together with single and continuous operating treadles, are standard equipment. Presses may be driven either by direct-connected motor or by flat or V-type belt. Crankshafts are alloy steel forgings, and are mounted in removable bronze bushings.

The automatic double roll feeds are the same as those used on the dieing machine. The feed rolls are ground and are of a diameter that ensures ample contacting surface. The upper roll is positively driven by the lower roll through large steel gears which are actuated through a ratchet and pawl mechanism. Feed is normally from right to left, but can be furnished in the opposite direction. The rolls on the left-hand side of the machine are driven from a crankshaft through bevel gears and driving rack. Rolls on the right-hand side of the machine are driven in synchronism with the opposite rolls by means of a connecting rack. The feeds are arranged with an automatic hand controlled latch, for release of the rolls for the continuous feeding of strip without stopping the press. Feed pitch is adjustable and the timing of roll feed action with relation to the crankshaft rotation can be varied. Cam-actuated, roll-release mechanism is also included. The scrap cutter provided can cut scrap into lengths equal to the feed pitch. It is driven directly from crankshaft by individual slide and pitman. The cutter is adjustable horizontally in the direction of the feed, and also vertically to meet metal line variations.

The press illustrated has a 6½ in. crankshaft at the bearings and has a bolster area of 36x47 in., the distance between uprights being 48 in. The press has a 6-in. stroke and is single geared to operate at 60 strokes per min. Overall height is 142 in., and the floor space required is 79x112 in. Weight is approximately 29,000 lb. Roll feeds of this press handle material up to 12½ in. in width, and a maximum feed pitch of 14 in.

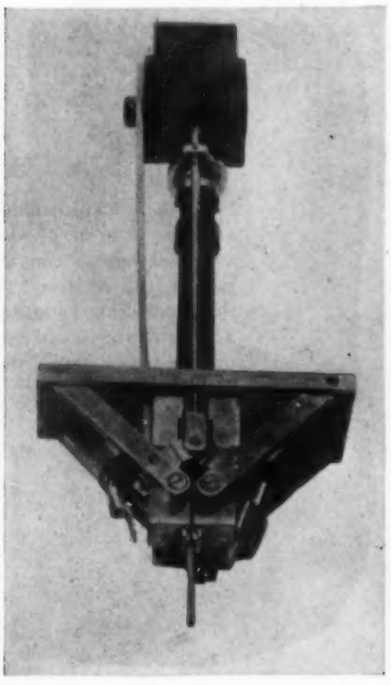


Feed pitch is adjustable, and the timing of the roll-feed action can be varied in relation to the crankshaft rotation. The automatic scrap cutter is driven from the crankshaft

"Welding Wire" Automatic Arc Welding Process and Coated Electrodes

The use of "Woven Welding Wire" and electrode contactor apparatus adapted by the Welding Wire Co., 28 Harvard St., New Britain, Conn., allows full automatic metallic arc welding. Woven Welding Wire consists of a solid core having multiple strands of wire woven thereon in the nature of a mesh, the pockets of which are filled with flux. The woven wire being an integral part of the core, suffices for current path to the core through an auxiliary contactor. Woven Welding Wire is a negative electrode.

The electrode contactor apparatus consists of a toggle-type, free passage contactor that separates the mechanical control from the contactor, so as to have the control non-conductive from a current and heat standpoint. Tangential grip feed rolls are used on the electrode feed. They lessen the required pressure for feeding the electrode, eliminating roll slippage as well as distortion of the electrode. A single-adjustment, plunger-roll type of straightener is included, to eliminate frictional wear on the contact inserts which are made of cadmium copper. The take-off reel consists of a tapered, demountable rim barrel, having a ground contactor which makes use of the electrode coil as a high resistance to balance the variable resistance of the arc. Welds made with Woven Welding Wire and electrode contactor apparatus show a tensile strength from 75,000 to 80,000 lb. per sq. in., and an elongation of 25 to 30 per cent. This equipment is adaptable to all standard automatic metallic arc welding units. Woven Welding Wire is furnished in coils having a tapered bore so as to be readily placed on the reel for use. Straightened and cut lengths are available for manual operation. Standard stock sizes are 1/8, 5/32, 7/64, 1/4 and 7/32 in. in diameter.

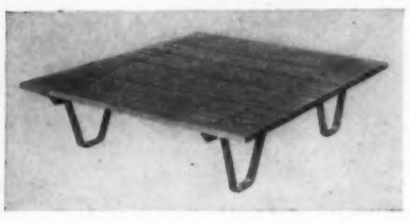


Ganschow Planetary Speed Reducer

The Ganschow Gear Co., 1013-15 Washington Blvd., Chicago, Ill., is making a line of planetary speed reducers. Each unit consists of a fully inclosed, self-oiling, planetary system of gears revolving within an internal ring gear. Three types of planetary transmission have been standardized: Type A, direct drive, Type B, angle drive, Type C, vertical drive. The Type A is shown.

Yale & Towne Skid Platforms

One of the features of the "Featherweight" skid platform manufactured by the Yale & Towne Mfg. Co., Philadelphia, Pa., is the ease with which it is handled. A 36x48 in. platform weighs less than 40 lb. Legs are welded to the deck angles to assure rigidity. Eight bolts in every foot of platform length provide a tie between lumber and deck angles. This reduces warping of deck boards. Platforms are built in sizes from 24 to 36 in. widths and 24 to 60 in. lengths. Under clearances are 6½, 7½ and 9½ in.

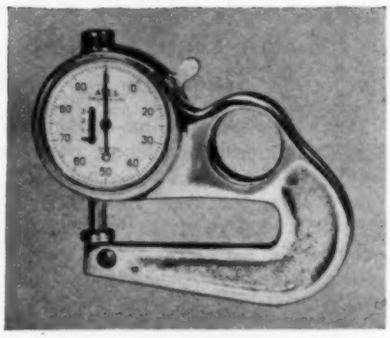


Milligan & Wright Blueprinter

A blueprint machine which utilizes the new Angstrom lamp has been placed on the market by Milligan & Wright Co., 4611 Prospect Ave., Cleveland, Ohio. The Angstrom lamp used in this machine is of the incandescent type. It operates from the regular 110-115 d.c. or a.c. lighting circuits without the need of transformer choke coils. The Model 100 is the portable table type which will print one 18x24 in., two 12x18 in., or four 9x12 in. prints at one time. Features of the machine are that one print can be made as economically as a dozen, it can be operated by anyone without danger of accident or fire, no special electrical equipment is required.

Ames 2-in. Throat Pocket Dial Gage

A gage that measures thickness of sheets 2 in. in from the edge is announced by the B. C. Ames Co., Waltham, Mass. The anvils are opened by pressing down a lever at the top, and closed with a uniform spring tension by releasing the lever. The gage has capacity for materials up to 7/32 in. in thickness. The 2-in. dial is graduated to indicate thousandths of an inch. These graduations are wide so that



Ames 2-In. Throat Pocket Dial Gage

finer measurements are easily estimated. A chart attached to the back gives fractions and decimal equivalents. The frame is bronze, chrome-plated. The crystal is unbreakable, and other parts are rust-proof. Weight is 7 ounces.

Landis Tap-Chaser, Rake-Grinding Attachment

The Landis Machine Co., Tap Division, Waynesboro, Pa., has developed an attachment for use in regrinding or sharpening the chasers used in Landis Style LT and Style LM receding chaser collapsible taps. The attachment is composed of three main parts. First, a base which is adapted for fastening to the table of most makes of tool and cutter grinders. Attached to the base is a second part, the swivel bracket, which is adjustable in a horizontal plane in relation to the base. The bottom part of the swivel bracket is graduated to permit obtaining the desired degree of azimuth, the angle at which the chaser is set from the parallel. The third part of the attachment is the vise base which is clamped to the swivel bracket and which holds the chaser while it is being ground. The vise base can be rotated in the vertical plane and securely clamped at any angle as determined by graduations on the top of the swivel bracket. This permits setting the chaser at the proper elevation for grinding the gun tap in the throat section of the rake. The vise base is provided with a milled flat which will accommodate all sizes of tap chasers. The chaser is held in place by an adjustable spring clamp and locked with a screw. The attachment is also suitable for Victor collapsible and receding chaser taps.

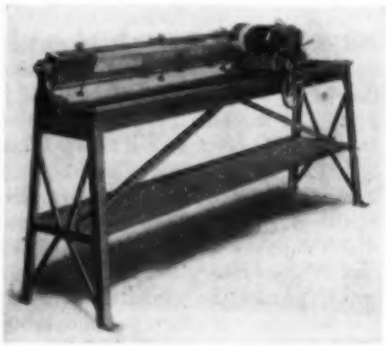
"Namco" Interchange Blade Chaser and Holding Block

An interchange chaser blade and holder, designed to meet the needs of threading jobs where changes from one job to another are frequent, is announced by the National Acme Co., Cleveland, Ohio. The blade chaser is slipped into a slot in the block, protruding on each end. On one end are the threads of the chaser with the ground cutting edge, and on the other end is ground a heel which is seated in the cup and assures accurate opening action. By building the cutting edge and the heel into one blade, correct location of the cutting edge is secured, and each chaser will take the same depth of chip. The blade is wider than the depth of the slot, making more grinds possible. It is made of high-speed steel and is fastened to the chaser holding block by two hollow hexagon screws. Only two sets of blocks are required for the entire range of cutting sizes. These chasers and blocks are interchangeable in the dies with the circular chasers and holding blocks of corresponding die size, in the rotating or non-rotating series. Sizes available are from ¼ to 1 in.

Chasers and blocks shown are interchangeable with circular chasers and blocks

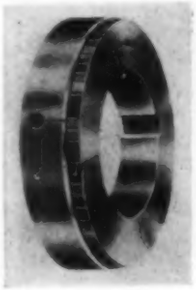
Rogers "Junior" Knife Grinder

The knife grinder, known as the "Junior," built by the Samuel C. Rogers Co., 191-205 Dutton Ave., Buffalo, N. Y., is available in three sizes; 61, 76 and 84 in. in length. The carriage with grinding wheel and motor is traversed by wheel, rack and pinion. Cross feed is effected by a small handwheel for moving the motor base which is gibbed to the lower part of the carriage. The carriage is made up of a bearing base, traverse wheel and pinion cross feeding slide with adjustable steel gib. The steel motor plate is swiveled for straight or concave bevel grinding. The knife bar is a reinforced one-piece casting with a coolant reservoir. It is supported by two end brackets and fitted with knife setup gates and clamps. A 6-in. cup wheel is mounted on the motor shaft, and covered by a guard. A ball-bearing ½-hp. motor of any voltage of frequency is provided. Specifications for the three sizes are: weight 600, 700 and 800 lb., height 48 in., lengths, 69, 84 and 92 in.



Dayton Rogers Spacing Collar

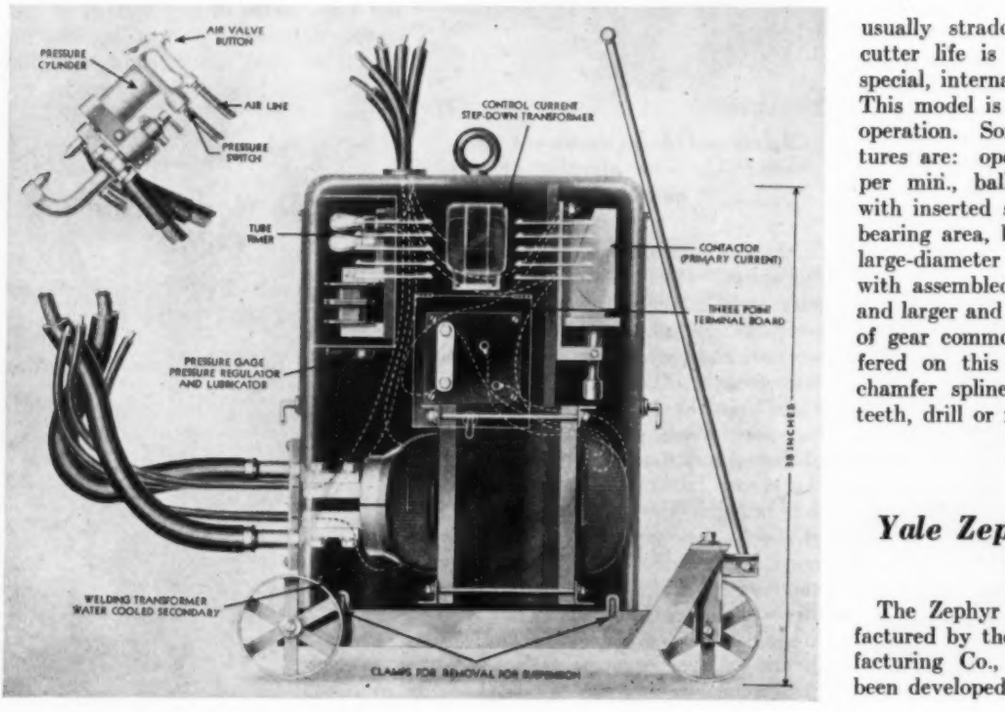
The Dayton Rogers Manufacturing Co., 1835 East Franklin St., Minneapolis, Minn., is manufacturing a spacing collar for milling machine cutter



arbors. It is designed for accurate spacing of side milling cutters, gang milling and various other multiple milling set ups. This adjustable spacing collar lends itself readily to close accurate work, and may be adjusted by thousandths by merely loosening the cutter arbor nut. Although the collars are graduated in thousandths, a quarter of a thousand graduation is easily obtained.

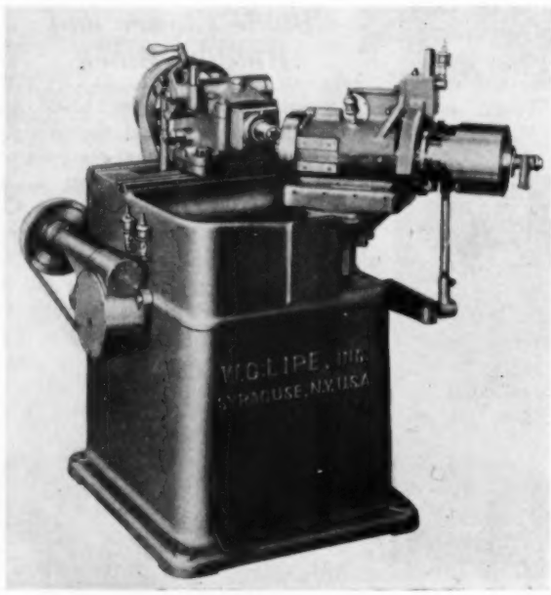
Thomson-Gibb Gun Welder

The Thomson-Gibb Electric Welding Co., Lynn, Mass., has developed a mobile welding machine, consisting of a welding gun which is operated by push button switch and a portable steel cabinet which contains all the transforming, regulating, contacting and timing apparatus. It is particularly adapted to assembly line production or to work which is fabricated in jigs. The machine is equipped with a demountable truck and a heavy lifting bolt, so that it can be wheeled to the work or suspended on a traveling hoist. A special over-size transformer which supplies a large volume of current at short intervals and a weld timer which breaks the circuit the instant the weld is completed, eliminate the need for water or air-cooled leads. Welds take only 1/20 to ½ of a second. The standard welding gun can be fitted with a wide variety of interchangeable water-cooled yokes. Yokes are made of special heavy wall copper tube, fitted with hard copper alloy welding tips. The gun is equipped with a built-in pressure-operated limit switch that automatically applies the current when the pressure in the air cylinder reaches the predetermined amount. It can be set to trip at any required air pressure. The unit illustrated can weld clean metal up to 16 gage, and the gun can be fitted with yokes having throat depths up to 12 in. Guns, yokes and complete transformer equipment are available for heavier work or work requiring larger throat depth.



Lipe Single-Spindle Gear-Tooth Chamfering Machine

The single-spindle, high-speed, gear-tooth chamfering machine announced by W. C. Lipe, Inc., Syracuse, N. Y., operates on the same basic principle that has been used in previous Lipe chamfering machines. The gear is mounted on the workhead by air-actuated collets or by a drawrod and U-washer clamp. It is automatically indexed by means of a hardened and ground master index ring. The cutter is automatically fed into the work, usually straddling two teeth. Long cutter life is secured by the use of special, internally formed hollow mills. This model is designed for high-speed operation. Some of the principal features are: operation up to 150 teeth per min., ball-bearing cutter spindle with inserted steel rack and increased bearing area, ball-bearing worm drive, large-diameter index and camshafts with assembled parts splined in place, and larger and heavier base. Any type of gear commonly used can be chamfered on this machine. It will also chamfer splines, burr helical or spur teeth, drill or mill.



Up to 150 teeth per min. can be chamfered on this single-spindle machine. Besides any common type of gear the machine will chamfer splines, burr helical and spur teeth, and mill and drill

Yale Zephyr Hand Lift Truck

The Zephyr hand-lift truck, manufactured by the Yale & Towne Manufacturing Co., Philadelphia, Pa., has been developed for average loads from

800 to 1,000 lb. This truck will handle a 36x42 in. skid platform in a 4 ft. aisle. The handle remains in position to pull the load when the load is elevated, or the load may be pushed or pulled with the handle locked in vertical position. The lifting mechanism is of steel and malleable casting. Axles and link shaft are locked to prevent turning or wear in the side rails. A reinforced steel plate, welded between the side rails, provides a deck which will permit the Zephyr to handle loads with or without skid platforms. When locked in the elevated position, the platform cannot be accidentally released.

Coffing Improved Spur Gear Gravity Hoist

The ball-bearing, spur-gear hoist announced by the Coffing Hoist Co., Danville, Ill., is made in three sizes. Rated capacities are: ½, 1 and 2 tons.

In raising the load this hoist operates like any ordinary chain hoist, but in lowering the load, a pull on the release rope releases the clutch and the load lowers by gravity. Lowering speed is controlled by a governor on the hand chain wheel. If there is no load on the hoist, free chain may be obtained for quick adjustment. Specifications for the three sizes are: Net weight, 63, 63 and 72 lb., lifting speed, 16, 6, and 3 ft. per min., lowering speed, 20 to 30, 15 to 20 and 15 to 20 ft. per min., minimum distance between hooks, 21, 21 and 23 in., standard lift, 8 ft. for all three and pull required to lift rated capacity, 48, 53 and 60 lb.

Diamond Special Grinder for Refrigerator Condenser Drums

The Diamond Machine Co., Providence, R. I., has built a special grinder for the grinding of eight circumferential welds on the face of a refrigerator condenser drum. Four 14-in. diameter wheels are driven by a single 20-hp. electric motor through V-belts. The two center wheels are on a single anti-friction bearing spindle, with provision for equalizing the pressure between them. The end wheels are on separate anti-friction bearing spindles. These wheel spindles are mounted at the end of vertically swinging arms, so that they may be raised or lowered from the work. These arms swing about the centers of the driving pulleys and are variable in length for belt adjustment. Each arm is counterweighted so that the wheels are normally lifted away from the cut. The pressure of the wheels on the work is governed by hydraulic means, each arm being equipped with a hydraulic cylinder for each wheel. Cylinders receive their pressure from a common source, thus insuring uniform pressure on all wheels. The equalized wheel pressure may be varied by the operator. This provides for uneven wheel wear. It also permits the operator to govern the depth of cut as required. An electric motor direct connected to a hydraulic oil pump furnishes power for this service.

The drums are held from the inside by a pneumatically expanded mechanical chuck. The holding unit is equipped to take different sizes of condenser drums. This unit is rotated by an electric motor through a Reeves drive. The work can be positioned beneath the grinding wheel without interference with the drive. This is accomplished by the use of sliding spur gear drives. A lock mechanism is employed to prevent side movement of the work while being ground. Controls are interlocked so that the machine cannot be operated without the work

having first been firmly gripped by the holding fixture and properly positioned under the wheel.

As the work holding fixture makes one revolution, four of the welds are ground. At a proper point in the cycle these wheels automatically lift, and the work holders stop. The work is then repositioned by a lever, placing the remaining four welds in relation to the abrasive wheels. The operation is then repeated.

Morton 120-In. Stroke Flash Trimming Machine

This high-duty draw-cut flash trimming machine is built by the Morton Manufacturing Co., Muskegon, Mich., for trimming the flash from butt-welded sheets having a seam up to 120 in. in length. It is designed to trim stock as thin as 20 gage. The vertical-moving, ram-carrying member raises the upper ram and clamping dies 2 in. for ease in entering and removing work. Automatic compensation in the upper ram is provided to take care of variations in metal thickness. Power is applied to the two reciprocating rams by means of a direct-connected reversing-type motor. A built-in wormgear reduction applies the power directly to the rack teeth cut in the sides of the ram by means of a vertical pinion. Cutting and return speed is approximately 60 ft. per min.

A feature of this machine is the die-cleaning and centering method. With the semi-automatic operation of the machine the work unclamps as soon as the cutting rams reach the inward position, and the work can be removed while the rams are returning to their initial position. A special electrical timing device is applied which operates a solenoid valve to blow air across the dies. The blast is accurately timed and adjustable from five to ten seconds. A special solenoid-operated, centering and lighting device is used within the upper ram.

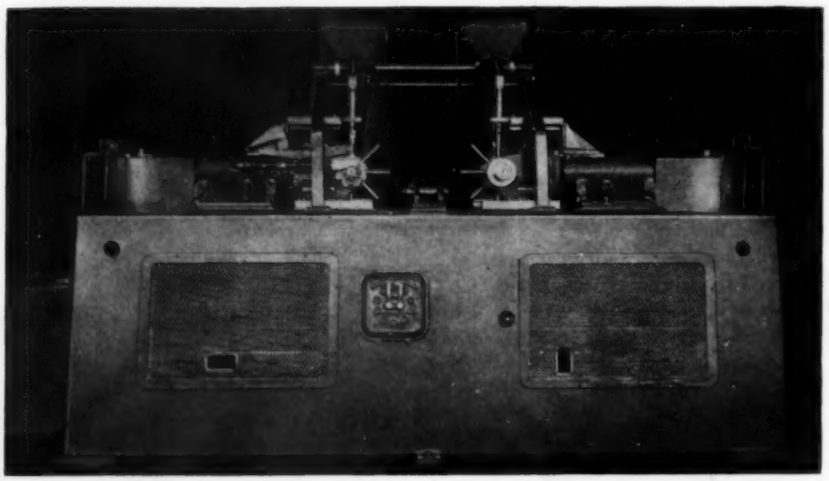
"Oliver" No. 159 Speed Lathe

The Oliver Machinery Co., Grand Rapids, Mich., has announced a speed lathe, known as the No. 159, for use in pattern shops. The lathe has a 12

in. swing over the bed. Drive is by a ½-hp. motor through a V-belt on adjustable cone sheaves. Any speed from 800 to 2,400 r.p.m. is available. An eccentric clamping type of toolrest holder, which can be clamped anywhere on the bed, is provided. Weight is approximately 490 lb.

Thomson-Gibb Automatic Stud Welder

A resistance welding machine developed by the Thomson-Gibb Electric Welding Co., Lynn, Mass., provides a way to manufacture on a mass production scale, parts that now require slow and expensive casting. For example, the machine welds studs to the circumferences of pipe. Operation is entirely automatic. Studs are loaded into the hoppers at the top of the machine from which they pass down into the magazine below and feed into position for multiple-indexing electrodes. Each pair of studs is attached at the same time by a series weld. Alignment and spacing are controlled



by the indexing fixtures, and the entire operation is performed at high speed. The same principle can be applied to welding bosses or studs to fabricated stampings or similar parts by the resistance welding method.

Correction

In the Annual Review and Catalog Number, the Landis Tool Co., Waynesboro, Pa., was credited (*AM*—Vol. 79, page 116) with four review items listed on pages 77, 78, 88 and 97. Credit should have been given the Landis Machine Co., Inc., Waynesboro, Pa., for the articles on pages 88 and 97.

THE ROUND TABLE

Tap Testing

"Looks as though you'd gone into the tap testing business, Al. What's the idea of having that boy spend his time in tapping a lot of holes in that plate? It can't be anything you're really going to use?"

"No, Ed, you're right about that. We won't use that plate; it will go into scrap when he gets through. But I figure it's a good investment both ways."

"That's a new one to me, Al; it looks like a waste of time. What's the bright idea, if there is one?"

"Ed, do you remember those jobs we did in the old shop that had that raft of tapped holes—holes that had to be a good fit for standard cap screws?"

"Sure, I remember. But what's that to do with this?"

"Then you only remember part of it. You've forgotten the grief we had in getting holes tapped the right size. Some were too loose and some were hard wrench fits. The trouble was they were not alike."

"Didn't Williams have the taps checked in the toolroom? We had wires and mikes for measuring them, I'm sure."

"Sure he had them checked, Ed. But we had trouble just the same. Taps are funny animals, Ed. The size hole they tap seems to depend on more than their measured pitch diameter. Even slight burrs, the way they are relieved, variations in lead or sometimes the kind of oil or other lubricant you use have considerable effect on the tapped hole."

"How do big concerns inspect taps for size if not by the 3-wire or optical methods? Do you mean to tell me you're testing tap size by using them to tap holes?"

"You guessed right that time, Ed. That's just what I'm doing. I've got the same kind of a job we had in the old shop. The holes have to be right. So I'm doing what a friend of mine says one of the biggest tap buyers in the country does. He drills standard holes in a plate of the same material he has to tap. These holes give about three-quarters full thread for iron and steel. Every new tap is put through one hole, and the thread is checked with a standard plug gage. If it's O.K., the tap goes to the toolroom for use. If the hole is large, or small, the tap is rejected, and either goes back to the maker or to some job where fit isn't so important."

"That doesn't sound like a modern method to me. What's the use of all our fine measuring instruments?"

"They all have their place, Ed. But all I want to know is—what size hole does the tap make?"

Is Al right in his method of selecting taps? Or will careful measurement tell the size hole they will produce?

Discussion

Trade Schools

The trade school is a valuable institution for teaching the first principles of engineering practice. In the writer's opinion it should be supported either financially or by gifts of machinery by neighborhood concerns. Contributions in money might be equally divided among the concerns, or in proportion to their individual demand upon the school for boys.

When the boy who has not attended a trade school enters a commercial shop, the work given him is of necessity a simple type, the operations of which must be taught and demonstrated by the foreman, taking up his valuable time. In trade schools, instruction in each workshop operation is given by competent instructors whose whole time is devoted to teaching. If a certificate is given the graduate of a trade school, with mention of subjects taught and passed, it would be a guaranty of his having reached a certain standard and he would be able to produce useful work when he enters a commercial shop.

I know of three concerns that train their own boys in separate departments. The first has a boy's milling department for small components of motor cars. The second has a general department for making simple tools. The third has a department for making bench lathes, which, except for final inspection, is run almost entirely by boys.

—W. A. Harris
Coventry, England

Shop Instructions

Notwithstanding the fact that the writer is now one of the warmest advocates for instruction sheets devised by an accredited planning department, there was a time until about 30 years ago when he was one of their bitterest opponents.

At one time the foreman was estimator, price setter, inspector, tool designer, instructor of apprentices and general disciplinarian of the shop. It can readily be understood what a seeming attack on his position it was when, without warning, work came into

the shop accompanied by instruction sheets and piecework tickets giving prices for every operation on the job.

The foreman, hitherto uncrowned king of the shop, got his back up at once and wondered if discharge were in the air. While seeking to discover why his traditional prerogatives had been so assailed and invaded, he was told that there was not the least occasion for him to worry, for the change would still leave him an indispensable official in the shop, and that his duties would be considerably less onerous.

—J. T. Towlson,
London, England.

Instruction sheets are essential to proper cost accounting, and their basis is fairness and accuracy.

For arriving at a better understanding of the subject, let us suppose that John Jones has been assembling a certain sub-assembly in the same way for the past five years. John Jones gets sick, and another man takes his place, assembles the parts in the way he thinks it should be done and actually reduces Jones' time by two hours. This situation could not exist if instruction sheets had been in use. With definite instructions, each part will be assembled in the same way without regard as to who does the work.

Instruction sheets are instrumental in revealing the fact that certain men are better adapted to certain phases of work than are others. If an enterprise is honestly interested in knowing how costs can be reduced and is willing to pay the cost of installation, instruction sheets will do wonders toward that end.

—Harold L. Wynn,
Executive Engineer,
Pacific Electric Mfg. Corporation.

Codified Skill

There are so many sides to the question of wage regulation that both Al and Ed have arguments on their side. If there was a fairly even proportion of men and jobs, we could probably let wages take care of themselves. But when a toolmaker has the choice of going hungry with his family or taking 25 cents an hour, as happened in Detroit less than two years ago, minimum wages seem necessary.

One of the "chisels" some concerns put over as soon as the NRA went into effect was to give executive titles to some of their workers so as to take them out of the jurisdiction of the codes. Many of these men who were "promoted" on paper, but not in the pay envelope, would prefer being regimented to the extent of being paid for overtime at least.

Minimum wages for skilled men are not new, even though they did depend on the locality and the state of business. How many of us have been told "we start machinists at 40 cents an hour" with intimation that the sky was the limit? Most of us found the limit considerably lower, however, unless some other shop broke the employer's code of "ethics" and offered us more.

Labor unions have long had a minimum wage for various degrees of skill. One great difficulty has been that they either had no good way of grading men or were indifferent to the fact that men varied in value. Some manufacturers find that standardization of wages is a help as it puts them all on the same footing in bidding for work.

—Frank C. Hudson.

● *Above:* A Greenlee special machine, for a car builder — Oilgear Fluid Power Feed equipment helps secure the desired production.

● *At Right:* A new Oilgear Fluid Power Feed. Note: Flanged mounting, as integral machine part . . . Inside pump eliminating hazard and bettering appearance . . . Self-contained; auxiliary valves, tubing, etc. are integral with pump . . . Many other exclusive features.

NEW FLUID POWER FEEDS

100 to 600% More
Rapid Traverse Speed

Up to 50% Lower Cost

Compensated
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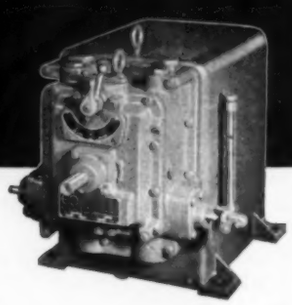

NEW records, long believed unattainable, are being hung up by Oilgear's totally new Fluid Power Feeds. Builders and buyers alike will see the significance in that. The new Oilgear book gives the whole story—better send for yours. The OILGEAR Company, 1309 W. Bruce Street, Milwaukee, Wis.

OILGEAR FLUID POWER FEEDS

Tooling Up

Al shows good horse sense in keeping down his jig and fixture expense. He wants to be certain that the job will carry the expenditure before he locks up good money in special tools.

Most of us have seen extremes in regard to jigs and fixtures. Some shops are run by guess and by gosh. The equipment is in the hay-wire stage and jigs and fixtures are conspicuous by their absence. On the other extreme there is the spic and span shop; a place for everything and everything in its place and a jig and a fixture for every job, but the jobs are scarce, and the books show red figures only.

Jigs and fixtures are costly tools and should be treated as such. They must be considered as subject in most cases to frequent changes, which cost money. Whenever a requisition for a jig or a fixture is brought to me, the signer thereof has to give a darn good reason to justify the expense, and if it doesn't fit into our economic lot fixture investment, a cheaper way must be found to do the job. Quite often a request for a jig or a fixture will bring forth a discussion of why the work should be done that way, or why the part should not be designed differently. A shop round table on jigs and fixtures will frequently save much capital from being locked up in special tools.

—JAY MURPHY.
General Manager,
Murphy Tool Mfg. Company.

I agree with Al's economy in the matter of fixtures, especially while his product is not large. If proper care is exercised in purchasing equipment that is suitable for the product, quite a number of parts may be produced without fixtures. It is better economy to purchase a few extra machines rather than to lock up capital in fixtures that are suitable for one particular part only.

It is unwise to invest in fixtures unless the production is large, or unless extreme accuracy is required in the product. I have seen quite a number of new fixtures that were slower to operate and would not produce as good work as so-called temporary tools that had been scrapped. —C. F. STAPLES.

Outlay for fixtures is not a matter to be based on budgetary control. Common sense; careful analysis of job lot quantities that can be run with impunity; consideration of the combined ability of the particular men and machines being used; and close examination into the probable degree of accuracy that it will be necessary to obtain advantageously are the factors upon which the amount that may consistently be spent for fixtures will logically be determined. A given fixture would not show the same economy in different shops.

Since one of the major factors in determining consistent fixture expenditure is the upper limit of lot quantities that may be maintained and the frequency with which such lot quantities may be run, it follows that the strength of the market cannot be ignored when the making of fixtures is under consideration. When the absorbtive capacity of the market for a great quantity of units is clearly indicated, making a full line of fixtures may be a good risk. But a weak or fluttering market indicates the need of greater care as to the amount of capital put into fixtures.

—JOHN E. HYLER.

No. 4
The production ratio of brass rod is at least 4 to 1 as compared with cold rolled Bessemer steel screw stock.

No. 8
Tool life on brass is from 4 to 8 times longer than on steel.

No. 11
Small tool breakage is considerably less when machining brass rod in an automatic screw machine.

No. 12
A machined finish on brass is always better than on steel; threads are cleaner and knurls are sharper.

4 *of* 20
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• TRADE • PUBLICATIONS

BELTING. A booklet distributed by the E. F. Houghton & Co., 240 W. Somerset St., Philadelphia, Pa., describes the line of Vim Tred leather belting for use on short-center drives. They also have available a complete handbook on short-center drives giving data on 5000 drives.

CHAINS AND SPROCKETS. The Baldwin-Duckworth Chain Corp., Springfield, Mass., has issued catalog K-1, on chains and sprockets for power transmission, conveying and elevating. It contains rules and formulas for determining chain size, length, pitch and sprocket diameters and ratios.

CIRCUIT BREAKERS. Folder GEA-1662A, published by the General Electric Co., Schenectady, N. Y., gives data and details of construction of type AL-2 trip-free air circuit breaker.

A machine for external grinding? Or one for internal grinding? Neither you say. But you do have a great variety of parts to external grind and still others to internal grind. Altogether only sufficient to keep one machine busy.

Great. You're the man we are looking for. The Landis 14" Type C Plain Hydraulic is the grinder you are looking for. Being a Universal it is equally suitable for a wide range of internal and external operations. Changing from an internal to an external set-up or vice-versa requires less time than on any similar machine we know of. Ample weight and wide speed ranges combine to produce work rapidly.

May we suggest as a first step the sending for catalog No. L-33. 176

LANDIS TOOL CO.
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DIAMONDS. The "Romance of Industrial Diamonds," a folder issued by Anton Smit & Co., 24 State St., New York, N. Y., discusses the history, characteristics and classification of diamonds. A table is given as guide in choosing the correct weight of stone for various grinding wheels.

GASOLINE TRACTOR CRANE. Bulletin No. 45, compiled by the Silent Hoist Winch & Crane Co., 762-772 Henry St., Brooklyn, N. Y., shows applications of the "Krane Kar," including dimension blueprints with capacity diagrams, and complete description and specifications.

GEARS. The Meisel Press Mfg. Co., 944 Dorchester Ave., Boston, Mass., has published a booklet on "Gear Craftsmanship." Included in the booklet are: "A Panorama of the Historical Progress of a Gear Manufacturer," "Ideas on Quality Gears" and "The Technical Craftsmanship of Quality Gears."

GEAR FINISHING MACHINES. Circulars have been prepared by the Cross Gear & Machine Co., 3250 Bellevue Ave., Detroit, Mich., describing its line of gear tooth rounding, pointing, chamfering and burring machines.

INDUSTRIAL EQUIPMENT. A 52-page catalog, published by L. O. Koven & Bros., Inc., 153 Ogden Ave., Jersey City, N. J., covers their entire range of plate and sheet metal products in all commercial metals and methods of construction.

LEATHER PACKINGS. Alexander Bros., Inc., 406 N. Third St., Philadelphia, Pa., has compiled a booklet containing prices and specifications for the various types of leather packing.

MACHINE TOOLS. In a 4-page folder the Eastern Machinery Co., 3261-69 Spring Grove Ave., Cincinnati, Ohio, presents its line of rebuilt machine tools.

PAINT. "Guide to Profit Through Paint," put out by the Sherwin-Williams Co., 101 Prospect Ave., N.W., Cleveland, Ohio, attempts to put paint on a unit cost basis. A well illustrated bulletin showing applications of the product.

PLATE MILL PRODUCTS. A booklet entitled "World's Largest Plate Mill and Its Products," put out by the Lukens Steel Co., Coatsville, Pa., is a pictorial summary of the work of the company and its divisions.

TRAVELING CRANES. The Whiting Corp., Harvey, Ill., has published a folder presenting its Model LH and LHE traveling cranes. A table of specifications and capacities is included.